DOCUMENT RESUME

ED 439 136 TM 030 670

AUTHOR	Barton, Paul E.
TITLE	What Jobs Require: Literacy, Education, and Training, 1940-2006. Policy Information Report.
INSTITUTION	Educational Testing Service, Princeton, NJ. Policy Information Center.
PUB DATE	2000-01-00
NOTE	86p.
AVAILABLE FROM	Policy Information Center, Mail Stop 04-R, Educational Testing Service, Rosedale Road, Princeton, NJ 08541-0001 ($10.50 prepaid). Tel: 609-734-5694 ($10.50, prepaid); e-mail: pic@ets.org; Web site: http://www.ets.org/research/pic.
PUB TYPE	Numerical/Quantitative Data (110) -- Reports - Research (143)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	Adults; Basic Skills; Census Figures; *Educational Attainment; Educational Trends; Employment Patterns; *Employment Qualifications; Job Analysis; *Job Skills; *Literacy; National Surveys; Tables (Data); *Training; Trend Analysis
IDENTIFIERS	*National Adult Literacy Survey (NCES)

ABSTRACT

This report assembles the best information available on past and future trends in employment and the education requirements of jobs in the post-World War II period, focusing on data for 1986 and 1996 and projections to 2006. The report's first section explains what is known from the 1992 National Adult Literacy Study, which measured prose, document, and quantitative literacy of more than 26,000 adults. The discussion of the literacy levels in terms of real-life situations is background for the second section, "Literacy and Occupations." This section presents employment trends in terms of the literacy requirements of jobs and examines the most rapidly growing and declining occupations, the occupations with the highest and lowest literacy requirements, and the average for all employment for those years. Information is gathered from the Bureau of Labor Statistics, the National Adult Literacy Study, and the Position Analysis Questionnaire, a job analysis program that has been applied to 2,200 jobs. The third section discusses employment and training requirements of occupations. The fourth section traces trends from World War II to the present, and the fifth section explains what the analysis means in the broad context of the operations of the labor market. The final section, "The Bottom Line," shows the long-term bias toward higher literacy requirements. Appendix A shows prose, document, and quantitative literacy for 1986, 1996, and projections for 2006. Appendix B discusses the methodology of the analysis. (SLD)

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Literacy, Education, and Training, 1940–2006

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January 2000

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Preface

Many statements are made about today's changing job requirements in terms of education and training requirements. A precise and accurate statement about past, present, and future education and training needs, is elusive, even with the best effort, and using the best research that is available, and trying to remain objective in doing so. The result is a somewhat dense text, following the dictate attributed to Albert Einstein, that things should be made as simple as possible, but no simpler.

Acknowledgments

We thank the following people at ETS who reviewed the manuscript and made many corrections and suggestions: Donna Desrochers, Andrew Latham, Irwin Kirsch, Garlie Forehand, and Richard Coley. We also received assistance from Richard Fry and Steven Rose, also of ETS. All reviewers do not necessarily agree with all conclusions reached in this report.

Fred Cline of ETS merged the data on literacy from the National Adult Literacy Study, the Position Analysis Questionnaire, and the Bureau of Labor Statistics employment projections, drawing on the prior research of Don Rock and Andrew Latham, of ETS.

Carla Cooper provided the desktop publishing, Amanda McBride provided editing, James Wert provided cover and layout design, and Ken Caputo was the production coordinator.

Introduction

The purpose of this report is to assemble the best information available on past and future trends in employment and in the education requirements of jobs in the post-World War II period. Specifically, we look first at data for 1986 and 1996, and at projections to 2006. This is no easy task, and there will be no precise answers. But it is possible to make some useful estimates, as well as reasonable projections into the next century, by analyzing and comparing several sources of information, including studies completed by ETS. Then, we look backwards to what was happening from 1940 up to the 1980s.

All of the efforts of the past, and those we have made for this report, deal with changing requirements that result from structural changes that change the distribution of occupations. No one has been able to examine each occupation to see how requirements may have changed *within* an occupation; we discuss this in some detail in the report.

Which fields are growing? Which are stable? And which are declining? How much educational preparation do they require to enter? How is the mix of occupations changing, and will it change in the future? How much capability with the printed word, and with computations, do today's jobs—and the jobs of the future—require? Do the occupations that are growing require more or less preparation or capability than those that are stable or declining?

The U.S. Bureau of Labor Statistics (BLS) has long reported employment by occupation, and has projected occupational trends into the future. Since World War II, the BLS has issued the *Occupational Outlook Handbook*, a valuable tool for counselors and for individuals choosing careers. Much of the information we report here, but not all, comes from analysis of BLS data.

Historically, the occupational classification system has been derived from rankings that reflect social and economic standing. The ranking began with the professions and worked down to laborers. They told more about the job's social status than the skills and education needed for that job. This problem with classifying jobs based on social status rather than skill requirements is an old one. Adam Smith observed it in *The Wealth of Nations*, saying that "...many inferior branches of country labour require much more skill and experience than the greater part of mechanic trades." He points out the uniformity of the work on brass and iron, but "the man who ploughs the ground with a team of horses or oxen, works with instruments of which the health, strength, and temperaments are very different upon different occasions, requiring judgment and discretion. The common ploughman, though generally regarded as the pattern of stupidity and ignorance, is seldom defective in this judgment and discretion."

Over the years, Census groupings have been refined. And the U.S. Department of Labor has produced another useful source of job-related information, the *Dictionary of Occupational Titles* (DOT), which describes jobs at a very detailed level for use by Employment Service Counselors and to facilitate job placement. Decades ago a "crosswalk"[1] was constructed that permitted translation of job characteristics provided by the DOT into the classification used by the BLS and the U.S. Bureau of the Census. This melding of information represented a breakthrough, providing a means for making general statements about the nature and direction of occupational change.

Work has also been done outside the government to regroup the official BLS/Census classifications to shed more light on how jobs and employment patterns are changing. At ETS, for example, Anthony Carnevale and Steven Rose[2] have reclassified jobs into categories based on where people actually work. This work shows that the greatest job growth has

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[1] Each Census classification has its equivalent in the DOT classification, enabling the user to move from one to the other.

[2] Anthony P. Carnevale and Steven J. Rose, *Education for What? The New Office Economy*, Educational Testing Service, 1998.

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been in office jobs, which is where the vast majority of people with advanced educations are employed. Jobs in hospitals and classrooms are also increasing, while "counter" jobs have been stable and factory and farm jobs have been declining.

Here, we are interested specifically in the literacy, education, and training requirements of jobs. The first section of this report explains what we know from the 1992 National Adult Literacy Study, carried out by Educational Testing Service under contract with the National Center for Education Statistics. That large assessment surveyed more than 26,000 individuals, measuring prose, document, and quantitative literacy. Section 1 describes that study and discusses what the different levels on the proficiency scales mean, in terms of what adults can do in real-life situations that require use of print materials. This is background for understanding the second section of this report.

Section 2, "Literacy and Occupations," presents employment trends in 1986, 1996, and projected to 2006, in terms of the literacy requirements of jobs. It looks at the most rapidly growing and declining occupations, the occupations with the highest and lowest literacy requirements, and the average for all employment in those years. Three components are brought together in this effort. The first cites the BLS/Census statistics on employment by occupation, as well as projections to 2006.[3] The second component consists of the National Adult Literacy Study (NALS), which reports on the literacy levels of employed people. And the third references the Position Analysis Questionnaire (PAQ), a job analysis approach to occupational requirements. At this point it is necessary to introduce the PAQ, for it is the basis for expanding the NALS proficiency scores to all the occupations that the BLS reports on, as well as converting them to actual job requirements rather than scores of the people who hold the jobs.

The PAQ is a job analysis program that has been performed for 2,200 jobs. It is a structured questionnaire that is used to analyze jobs on the basis of 187 job elements that describe generic human work behaviors. These elements are organized into six dimensions:

1. Information Input (Where and how does the worker get the information that is used in performing the job?)

2. Mental Processes (What reasoning, decision-making, planning, and information processing activities are involved in performing the job?)

3. Work Output (What physical activities does the worker perform, and what tools or devices are used?)

4. Relationships with Other Persons (What relationships with other people are required in performing the job?)

5. Job Context (In what physical and social context is the work performed?)

6. Other Job Characteristics (What activities, conditions, or characteristics other than those described above are relevant to the job?)

A complete description of the PAQ and the PAQ database is provided in the *Technical Manual for the Position Analysis Questionnaire*, by E. J. McCormick, R. C. Mecham, and P. R. Jeanneret, published by the Consulting Psychologists Press in 1989.[4]

This report translates PAQ results into the NALS prose, document, and quantitative proficiencies, a process that was made possible by a study carried out in 1996 by Don Rock and Andy Latham at ETS, and P. R. Jeanneret of Jeanneret and Associates, under a contract with the U.S. Department of Labor. The title of the study describes its

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[3] The source is the U.S. Department of Labor, Bureau of Labor Statistics, "Occupational Projections and Training Data, 1998-1999 Edition," Bulletin 2501. All data in the report are available at the BLS Web site, *http://www.stats.bls.gov*.

[4] They have also written *The Job Analysis Handbook* for business, industry, and government, 1988, and *Position Analysis Questionnaire*, 5th printing, 1993.

purpose: Estimating Prose, Document, and Quantitative Literacy Scores from Position Analysis Questionnaire Dimensions: An Empirical Linkage Between Adult Literacy Skills and Job Analysis Information. The correlations between NALS and PAQ were found to be sufficiently high to permit such estimation, and this was carried out for 522 jobs.

To produce this report, however, these NALS scores had to be linked to the BLS employment data by occupation, and then projected to 2006. The required data for 1996 and 2006 were published in the November 1996 *Monthly Labor Review* in an article by George T. Silvester.[5] The 1986 data was not as detailed as the 1996 data. BLS supplied data for the 1986 occupational trends that more nearly matched the published 1996 data. However, the BLS data was still not as detailed as the 1996 data, so there are some individual 1986 occupations for which we do not have comparable data for 1996 and 2006.

The marrying of these estimated NALS scores to the BLS employment statistics was carried out by Fred Cline in the ETS Research Division. An intermediate step was needed, since the estimated scores for these 522 occupations were in the classification system of the *Dictionary of Occupational Titles*. The conversion had to be made manually using the "crosswalk" developed by the Department of Labor, referred to above. The methodology used by Cline is summarized in Appendix B. All the data produced for this report on literacy is included in Appendix A. Summary tables are provided in Section 2.

The presentation of data in Section 3, "Employment/Training Requirements and Occupations," is more straightforward. As stated above, BLS compiles, in tabular form, the key data used in its *Employment Outlook Handbook*, which is available in a publication called *Occupational Projections and Training Data*. The 1998-1999 edition was published by the Bureau of Labor Statistics as Bulletin 2501. All the data is available at the BLS Web site, *http://www.stats.bls.gov*, and can be downloaded in different arrangements, such as by education/training requirement, or the percent increase in employment by occupation, for example. To compile this report, we need to tabulate employment and job opening data by education/training requirement categories, such as "all occupations that require a B.A. degree."

Since the BLS data is readily available on the Web, we have not included the detailed tables, which provide information for more than 500 occupations. In Section 3, we present our tabulations.

The principle purpose of this report is to generalize the literacy, education, and training requirements of the workforce, as well as to project these requirements into the near future. However, the data for individual occupations will be valuable for many purposes, so we have included the literacy tables for such uses. This is also true of the education/training requirement data, available at the BLS Web site. The uses of NALS data are many, and ETS has published a number of studies using this important database. A recent one was *Getting Down to Business: Matching Welfare Recipients to Jobs That Train*, by Anthony Carnevale and Donna Desrochers, which used NALS data to analyze jobs and training needs for persons leaving the welfare rolls. Carnevale and Desrochers also have in process a report that takes a broader look at skills and the economy as a whole.

Sections 2 and 3 present the two analyses described above. The fourth section is titled "Looking Backward." It traces trends from the post-World War II period to the 1980s. A substantial amount of information is available, coming most importantly from the work of James Scoville. The last section is "Putting it in Context," which tries to explain what this information means, and does not mean, in the broader context of the operation of the labor market.

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[5] Also at the BLS Employment Projections Web site, *http://www.stats.bls.gov/emphome.htm*, under "Most Requested Tables."

Section 1:

Measuring Literacy

This section of the report describes NALS and its definition of literacy. NALS provides the most detailed portrait that has ever been available on the conditions of literacy in the United States—and on the unrealized potential of the nation's citizens.[6]

For the 1992 survey, trained staff interviewed nearly 13,600 individuals age 16 and older, who were randomly selected to represent the U.S. adult population; state samples and a sample of federal and state prison inmates pushed the final number of individuals surveyed to more than 26,000. Each participant was asked to spend about an hour responding to a series of diverse literacy tasks, as well as to questions about his or her demographic characteristics, educational background, reading practices, and other areas related to literacy.

To analyze the literacy skills of any group, it is first necessary to define what is meant by "literacy." The term is often used as the opposite of "illiteracy," which is typically interpreted to mean not being able to read at all, decode the printed word, or comprehend what is written. But literacy has a much richer and deeper meaning than that. Its dictionary definitions range from being able to read and write; to being a well-informed, educated person; to being familiar with literature.

NALS was guided by the following definition of literacy, adopted by a broadly representative group of experts:

> *Using printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential.*

NALS focused on three areas of literacy proficiency—prose, document, and quantitative.

Prose literacy - the knowledge and skills needed to understand and use information from texts that include editorials, news stories, poems, and fiction; for example, finding a piece of information in a newspaper article, interpreting instructions for a warranty, inferring a theme from a poem, or contrasting views expressed in an editorial.

Document literacy - the knowledge and skills required to locate and use information contained in everyday materials such as job applications, payroll forms, transportation schedules, maps, tables, and graphs; for example, locating a particular intersection on a street map, using a schedule to choose the appropriate bus, or entering information on an application form.

Quantitative literacy - the knowledge and skills required to apply arithmetic operations, either alone or sequentially, using numbers embedded in printed materials; for example, balancing a checkbook, figuring out a tip, completing an order form, or determining an amount of interest from a loan advertisement.

Based on their performance on the literacy tasks, respondents were assigned scores on the three proficiency scales, each ranging from 0 to 500. While most previous studies of literacy have attempted to identify the number of "illiterates," the goal of NALS was different—to profile the nation's literacy skills. Thus, there is no single point on the literacy scale that separates illiterates from literates, per se. Rather, each scale is divided into five levels of proficiency, each encompassing a range of scores.

Level 1 - *scores from 0 to 225*

Level 2 - *scores from 226 to 275*

Level 3 - *scores from 276 to 325*

Level 4 - *scores from 326 to 375*

Level 5 - *scores from 376 to 500*

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6 NALS was funded by the U.S. Department of Education and administered by Educational Testing Service, in collaboration with Westat Inc. The first volume in the series offers an overview of the results. See Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins, and Andrew Kolstad, *Adult Literacy in America: A First Look at the Results of the National Adult Literacy Survey*, prepared by Educational Testing Service for the National Center for Education Statistics, U.S. Department of Education, September 1993. Additional NALS reports offer a more detailed look at particular issues, including literacy in the workforce, literacy and education, literacy among older adults, literacy in the prison population, literacy and cultural diversity, and literacy practices.

Individuals scoring within one of these scale levels have a high probability of performing the tasks at that level successfully.[7] Those who performed at Level 1 demonstrated the lowest literacy proficiencies, while those at Level 5 displayed the highest proficiencies. Similarly, the tasks that characterized Level 1 were the least challenging in the assessment, while those associated with Level 5 were the most difficult.

Sample tasks are provided here to illustrate the types of literacy skills exhibited by those who performed at each level. To avoid excessive detail, we have only provided example tasks for prose literacy. Readers who would like to know more about the tasks or see additional examples should refer to other NALS reports.[8]

Level 1

Prose. What does it mean to score at Level 1? Some individuals scoring at this level on the prose scale demonstrate the ability to read relatively short pieces of text, such as a brief newspaper article, to find a piece of information that is identical to or synonymous with information given in a directive. Typically, little or no distracting information (information that seems plausible but is incorrect) is present in such tasks. Individuals who perform at Level 1 may succeed in prose tasks that ask them to:

- identify a country mentioned in a short article (score of 149)

Example Task For Prose Literacy, Level 1

Underline the sentence that tells what Ms. Chanin ate during the swim.

Swimmer completes Manhattan marathon

The Associated Press

NEW YORK—University of Maryland senior Stacy Chanin on Wednesday became the first person to swim three 28-mile laps around Manhattan.

Chanin, 23, of Virginia, climbed out of the East River at 96th Street at 9:30 p.m. She began the swim at noon on Tuesday.

A spokesman for the swimmer, Roy Brunett, said Chanin had kept up her strength with "banana and honey" sandwiches, hot chocolate, lots of water and granola bars."

Chanin has twice circled Manhattan before and trained for the new feat by swimming about 28.4 miles a week. The Yonkers native has competed as a swimmer since she was 15 and hoped to persuade Olympic authorities to add a long-distance swimming event.

The Leukemia Society of America solicited pledges for each mile she swam.

In July 1983, Julie Ridge became the first person to swim around Manhattan twice. With her three laps, Chanin came up just short of Diana Nyad's distance record, set on a Florida-to-Cuba swim.

[7] A high probability is defined as at least 80 percent of the time. Individuals would have a small chance of performing tasks at a higher level.

[8] See the original NALS report cited in footnote 5. A summary is also provided in Paul E. Barton, *Becoming Literate About Literacy*, Policy Information Report, ETS Policy Information Center, 1994.

- locate a piece of information in a sports article (score of 210)

- underline a sentence explaining the action stated in a short article (score of 225)

Document. Some individuals who score at Level 1 are able to locate a piece of information based on a literal match between the directive and the document, as long as little, if any, distracting information is present. Some adults at this level also display the ability to enter basic information about themselves onto an application form or other type of document. Specifically, individuals at Level 1 may be able to:

- sign their name on a brief form (score of 60)

- locate a meeting time on a form (score of 180)

- use a pie chart to locate a type of vehicle that had a given number of sales (score of 214)

Quantitative. Some individuals who score at Level 1 demonstrate the ability to perform single, relatively simple arithmetic operations, such as addition. The numbers to be used in such tasks are provided, and the operation to be performed is specified. Those scoring at the lowest level on the quantitative scale may be able to:

- total a bank deposit entry (score of 191)

Level 2

Prose. Individuals scoring at this level on the prose scale demonstrate the ability to locate a piece of information in a piece of text

Example Task For Prose Literacy, Level 2

A manufacturing company provides its customers with the following instructions for returning appliances for service:

> **When returning appliance for servicing, include a note telling as clearly and as specifically as possible what is wrong with the appliance.**

A repair person for the company receives four appliances with the following notes attached. Circle the letter next to the note which best follows the instructions supplied by the company.

A **The clock does not run correctly on this clock radio. I tried fixing it, but I couldn't.**

B **My clock radio is not working. It stopped working right after I used it for five days.**

C **The alarm on my clock radio doesn't go off at the time I set. It rings 15-30 minutes later.**

D **This radio is broken. Please repair and return by United Parcel Service to the address on my slip.**

even when distracting information is present. They also appear to have little difficulty integrating, comparing, and contrasting two or more pieces of information found in printed material. Individuals at this level are likely to be successful on literacy tasks that ask them to:

- underline the meaning of a term in a brochure on government benefits (score of 226)
- locate two types of information in a sports article (score of 250)
- interpret instructions from an appliance warranty (score of 275)

Document. Those scoring at Level 2 on the document scale display skill at matching a piece of information in a form or other type of document with information in a directive, even when distracting information is present. Low-level inferences are sometimes required in performing such tasks. In addition, individuals at Level 2 are likely able to:

- locate an intersection on a street map (score of 230)
- locate eligibility information in a table of employee benefits (score of 246)
- identify and enter background information on a Social Security card application (score of 259)

Quantitative. Individuals at Level 2 display the ability to perform a single arithmetic operation using numbers that are given to them or that can easily be located in printed material. Adults at this level are likely able to:

- calculate postage and fees for certified mail (score of 238)
- determine the difference in price between tickets for two shows (score of 246)
- calculate the total cost of purchases from an order form (score of 270)

Level 3

Prose. Individuals scoring at Level 3 on the prose scale demonstrate the ability to match information in a piece of printed material with information in a directive when low-level inferences are required. They also display skill at integrating information from dense or lengthy text. Level 3 scorers are likely to succeed at literacy tasks asking them to:

- write a brief letter explaining a billing error (score of 288)
- find a sentence in a news article that interprets a situation (score of 304)
- read a lengthy article to identify behaviors that meet a stated condition (score of 316)

Document. Individuals performing at Level 3 appear to have little difficulty integrating several pieces of information from one or more documents. They also display skill at using and interpreting rather complex tables and graphs containing information that is either irrelevant or inappropriate to the task. Adults at this level can:

- identify information in a bar chart showing energy sources for various years (score of 277)
- enter information into an automobile maintenance record form (score of 323)

Quantitative. Individuals at Level 3 demonstrate skill at performing tasks in which two or more numbers must be found in a piece of printed material to solve an arithmetic problem. The mathematical operation(s) to be performed can be determined from the terms used in the directive. Some of the tasks in this level involve the use of a calculator. Adults at Level 3 are likely able to:

- calculate the difference between the regular and sale prices of an item in an advertisement (score of 278)
- determine the discount from an oil bill if paid within 10 days (score of 308)
- calculate miles per gallon using information from a mileage record chart (score of 321)

Level 4

Prose. Individuals scoring at this level display the ability to match multiple pieces of information in

EXAMPLE TASK FOR PROSE LITERACY, LEVEL 3

List two things that Chen became involved in or has done to help resolve conflicts due to discrimination.

IDA CHEN is the first Asian-American woman to become a judge of the Commonwealth of Pennsylvania.

She understands discrimination because she has experienced it herself.

Soft-spoken and eminently dignified, Judge Ida Chen prefers hearing about a new acquaintance rather than talking about herself. She wants to know about career plans, hopes, dreams, fears. She gives unsolicited advice as well as encouragement. She instills confidence.

Her father once hoped that she would become a professor. And she would have also made an outstanding social worker or guidance counselor. The truth is that Chen wears the cape of all these professions as a Family Court judge of the Court of Common Pleas of Philadelphia County, as a participant in public advocacy for minorities, and as a particularly sensitive, caring person.

She understands discrimination because she has experienced it herself. As an elementary school student, Chen tried to join the local Brownie troop. "You can't be a member," she was told. "Only American girls are in the Brownies."

Originally intent upon a career as a journalist, she selected Temple University because of its outstanding journalism department and affordable tuition. Independence being a personal need, she paid for her tuition by working for Temple's Department of Criminal Justice. There she had her first encounter with the legal world and it turned her career plans in a new direction — law school.

Through meticulous planning, Chen was able to earn her undergraduate degree in two and a half years and she continued to work three jobs. But when she began her first semester as a Temple law student in the fall of 1973, she was barely able to stay awake. Her teacher Lynne Abraham, now a Common Pleas Court judge herself, couldn't help but notice Chen yawning in the back of the class, and when she determined that this student was not a party animal but a workhorse, she arranged a teaching assistant's job for Chen on campus.

After graduating from Temple Law School in 1976, Chen worked for the U.S. Equal Employment Opportunity Commission where she was a litigator on behalf of plaintiffs who experienced discrimination in the workplace, and then moved on to become the first Asian-American to serve on the Philadelphia Commission on Human Relations.

Appointed by Mayor Wilson Goode, Chen worked with community leaders to resolve racial and ethnic tensions and also made time to contribute free legal counsel to a variety of activist groups.

The "Help Wanted" section of the newspaper contained an entry that aroused Chen's curiosity — an ad for a judge's position. Her application resulted in her selection by a state judicial committee to fill a seat in the state court. And in July of 1988, she officially became a judge of the Court of Common Pleas. Running as both a Republican and Democratic candidate, her position was secured when she won her seat on the bench at last November's election.

At Family Court, Chen presides over criminal and civil cases which include adult sex crimes, domestic violence, juvenile delinquency, custody, divorce and support. Not a pretty picture.

Chen recalls her first day as judge, hearing a juvenile dependency case — "It was a horrifying experience. I broke down because the cases were so depressing," she remembers.

Outside of the courtroom, Chen has made a name for herself in resolving interracial conflicts, while glorying in her Chinese-American identity. In a 1986 incident involving the desecration of Korean street signs in a Philadelphia neighborhood, Chen called for a meeting with the leaders of that community to help resolve the conflict.

Chen's interest in community advocacy is not limited to Asian communities. She has been involved in Hispanic, Jewish and Black issues, and because of her participation in the Ethnic Affairs Committee of the Anti-Defamation League of B'nai B'rith, Chen was one of 10 women nationwide selected to take part in a mission to Israel.

With her recently won mandate to judicate in the affairs of Pennsylvania's citizens, Chen has pledged to work tirelessly to defend the rights of its people and contribute to the improvement of human welfare. She would have made a fabulous Brownie.

— Jessica Schultz

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a piece of writing. Further, they appear to be able to integrate or synthesize information from complex or lengthy pieces of text and to make complex inferences about what they read. They are likely to succeed at tasks that ask them to:

- state in writing an argument made in a lengthy newspaper article (score of 328)
- contrast views expressed in two editorials on fuel-efficient cars (score of 359)
- compare two metaphors used in a poem (score of 374)

Document. Individuals at Level 4 are able to make high-level inferences to interpret various types of documents. They also appear to have little difficulty performing tasks that involve the use of conditional information. They are likely able to:

- use a table to identify the percentage of cases that meet specified conditions (score of 342)

EXAMPLE TASK FOR PROSE LITERACY, LEVEL 4

Contrast Dewey's and Hanna's views about the existence of technologies that can be used to produce more fuel-efficient cars while maintaining the size of the car.

Face-Off: Getting More Miles Per Gallon

Demand cars with better gas mileage

By Robert Dewey
Guest columnist

WASHINGTON — Warning: Automakers are resurrecting their heavy-metal dinosaurs, aka gas guzzlers.

Government reports show that average new-car mileage has declined to 26.2 miles per gallon — the 1980 level. To reverse this trend, Congress must significantly increase existing gas-mileage standards.

More than half our Nobel laureates and 700 members of the National Academy of Sciences recently called global warming "the most serious environmental threat of the 21st century." In 1989, oil imports climbed to a near-record 48% of U.S. consumption. Increasing gas mileage is the single biggest step we can take to reduce oil imports and curb global warming. Greater efficiency also lowers our trade deficit (oil imports represent 40% of it) and decreases the need to drill in pristine areas.

Bigger engines and bigger cars mean bigger profits for automakers, who offer us the products they want us to buy. More than ever, Americans want products that have less of an environmental impact. But with only a few fuel-efficient cars to choose from, how do we find ones that meet all our needs?

Government studies show automakers have the technology to dramatically improve gas mileage — while maintaining the 1987 levels of comfort, performance and size mix of vehicles. Automakers also have the ability to make their products safer. The cost of these improvements will be offset by savings at the gas pump!

Cars can average 45 mpg and light trucks 35 mpg primarily by utilizing engine and transmission technologies already on a few cars today. Further improvements are possible by using technologies like the two-stroke engine and better aerodynamics that have been developed but not used.

When the current vehicle efficiency standards were proposed in 1974, Ford wrongly predicted that they "would require either all sub-Pinto-sized vehicles or some mix of vehicles ranging from a sub-subcompact to perhaps a Maverick." At that time, Congress required a 100% efficiency increase; raising gas mileage to 45 mpg requires only a 60% increase.

Americans want comfortable, safe and efficient cars. If automakers won't provide them, Congress must mandate them when it considers the issue this summer.

Let's hope lawmakers put the best interest of the environment and the nation ahead of the automakers' lobbyists and political action committees.

Robert Dewey is a conservation analyst for the Environmental Action Foundation.

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Don't demand end to cars people want

By Thomas H. Hanna
Guest columnist

DETROIT — Do Americans look forward to the day when they'll have to haul groceries, shuttle the kids to and from school or take family vacations in compact and subcompact cars?

I doubt it — which is why U.S. and import carmakers oppose the 40-miles-per-gallon to 45 mpg corporate average fuel economy mandates that some are pushing in Congress, either to curb tailpipe carbon dioxide emissions because of alleged global warming or for energy conservation.

Since the mid-1970s, automakers have doubled the fleet average fuel economy of new cars to 28 mpg — and further progress will be made.

Compact and subcompact cars with mileage of 40 mpg or better are now available, yet they appeal to only 8% of U.S. car buyers.

But to achieve a U.S. fleet average of 40 mpg to 45 mpg, carmakers would have to sharply limit the availability of family-size models and dramatically trim the size and weight of most cars.

There simply are not magic technologies to meet such a standard.

Almost every car now sold in the USA would have to be drastically downsized, and many would be obsolete.

As a result, Americans each year would be unable to buy the vehicles most suited for their needs: mid- and family-size models, luxury automobiles, mini-vans, small trucks and utility vehicles.

The fleet shift to composite and subcompacts could also force the closing of assembly plants, supplier firms and dealerships, at a cost of thousands of U.S. jobs.

Although a growing number of scientists are skeptical of global warming, the issue deserves thorough international scientific evaluation, not premature unilateral U.S. action.

Carbon dioxide emissions from U.S. vehicles total less than 2.5% of worldwide "greenhouse" gases. Even doubling today's corporate average fuel economy for U.S. cars — if technically possible — would cut those gases about 1%.

Whatever the motivation — alleged global warming or energy conservation — the stakes are high for millions of Americans and thousands of U.S. jobs in unrealistic corporate average fuel economy mandates.

Thomas H. Hanna is president and chief executive officer of the Motor Vehicle Manufacturers Association of the United States.

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EXAMPLE TASK FOR PROSE LITERACY, LEVEL 5

Identify and summarize the two kinds of challenges that attorneys use while selecting members of a jury.

DO YOU HAVE A QUESTION?

QUESTION: What is the new program for scheduling jurors?

ANSWER: This is a new way of organizing and scheduling jurors that is being introduced all over the country. The goals of this program are to save money, increase the number of citizens who are summoned to serve and decrease the inconvenience of serving.

The program means that instead of calling jurors for two weeks, jurors now serve only one day, or for the length of one trial if they are selected to hear a case. Jurors who are not selected to hear a case are excused at the end of the day, and their obligations to serve as jurors are fulfilled for three years. The average trial lasts two days once testimony begins.

An important part of what is called the One Day – One Trial program is the "standby" juror. This is a person called to the Courthouse if the number of cases to be tried requires more jurors than originally estimated. Once called to the Courthouse, the standby becomes a "regular" juror, and his or her service is complete at the end of one day or one trial, the same as everyone else.

Q. How was I summoned?

A. The basic source for names of eligible jurors is the Driver's License list which is supplemented by the voter registration list. Names are chosen from these combined lists by a computer in a completely random manner.

Once in the Courthouse, jurors are selected for a trial by this same computer and random selection process.

Q. How is the Jury for a particular trial selected?

A. When a group of prospective jurors is selected, more than the number needed for a trial are called. Once this group has been seated in the courtroom, either the Judge or the attorneys ask questions. This is called *voir dire*. The purpose of questions asked during *voir dire* is to ensure that all of the jurors who are selected to hear the case will be unbiased, objective and attentive.

In most cases, prospective jurors will be asked to raise their hands when a particular question applies to them. Examples of questions often asked are: Do you know the Plaintiff, Defendant or the attorneys in this case? Have you been involved in a case similar to this one yourself? Where the answer is yes, the jurors raising hands may be asked additional questions, as the purpose is to guarantee a fair trial for all parties. When an attorney believes that there is a legal reason to excuse a juror, he or she will challenge the juror for cause. Unless both attorneys agree that the juror should be excused, the Judge must either sustain or override the challenge.

After all challenges for cause have been ruled upon, the attorneys will select the trial jury from those who remain by exercising peremptory challenges. Unlike challenges for cause, no reason need be given for excusing a juror by peremptory challenge. Attorneys usually exercise these challenges by taking turns striking names from a list until both are satisfied with the jurors at the top of the list or until they use up the number of challenges allowed. Challenged jurors and any extra jurors will then be excused and asked to return to the jury selection room.

Jurors should not feel rejected or insulted if they are excused for cause by the Court or peremptorily challenged by one of the attorneys. The *voir dire* process and challenging of jurors is simply our judicial system's way of guaranteeing both parties to a lawsuit a fair trial.

Q. Am I guaranteed to serve on a jury?

A. Not all jurors who are summoned actually hear a case. Sometimes all the Judges are still working on trials from the previous day, and no new jurors are chosen. Normally, however, some new cases begin every day. Sometimes jurors are challenged and not selected.

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- use a schedule to determine which bus to take in a given situation (score of 352)

- use a table to identify a pattern of oil exports over time (score of 352)

Quantitative. Individuals at this level have little difficulty performing two or more arithmetic operations in a sequence. They can also perform single arithmetic operations in which the quantities are found in different types of displays, or in which the operations must be inferred from the information given or from prior knowledge. These individuals are likely to succeed when asked to:

- use information in a news article to calculate how much money should go to raising a child (score of 350)

- use an eligibility pamphlet to calculate how much money a couple would receive for basic supplemental security income in one year (score of 368)

Level 5

Prose. Individuals at this level have little difficulty finding information in dense text that contains a considerable amount of distracting information. They can also make high-level inferences and use specialized background knowledge to help them understand what they read. Level 5 scorers can succeed at tasks asking them to:

- compare the approaches stated in a narrative on growing up (score of 382)

- summarize two ways in which lawyers may challenge prospective jurors (score of 410)

- interpret a brief phrase from a lengthy news article (score of 423)

Document. These individuals have the ability to search through complex displays that contain several pieces of distracting information. They also have little difficulty making high-level inferences and using specialized background knowledge to interpret information in documents. They are likely able to:

- use information in a table to complete a graph, including labeling the axes (score of 378)

- use a table to compare credit cards, identify two categories of comparison, and write about the differences (score of 387)

- use information from a table to write a paragraph about a school survey (score of 395)

Quantitative. Individuals at this level can perform multiple arithmetic operations sequentially. They are also able to find the features of problems in a piece of printed material and to use their background knowledge to determine the quantities or operations needed. People at this literacy level are likely to succeed with tasks that ask them to:

- use an order form to calculate the shipping costs and total costs of items (score of 382)

- use information from a news article to calculate the difference in times for completing a race (score of 405)

- use a calculator to figure the total cost of carpet for a room (score of 421)

Section 2: Literacy and Occupations

In this section we will answer the following questions: (1) How much have the overall literacy requirements of jobs in America changed, on average, from 1986 to 1996, and (2) How much are they expected to change from 1996 to 2006? More specifically, we will examine in detail the expected changes from 1996 to 2006, focusing on the fastest and slowest growing occupations as well as the occupations with the highest and lowest literacy requirements.

The occupational employment data for past years, as well as the projections for 2006, are the product of the U.S. Bureau of Labor Statistics (BLS), which has been making such projections since about World War II. They have been correct in the direction of change, but often miss the mark in the amount of change in an individual occupation.[9]

The estimates of literacy requirements we will marry to these BLS data and projections were explained in the preceding section. What we will be discussing is the change in literacy requirements in the workforce that result from the changing distribution of employment among the occupations. For example, average literacy requirements in the entire workforce will be affected by a large increase in the number of truck drivers (who have average prose literacy requirements of 268), growing from 2.2 million in 1986 to 2.7 million in 1996, and projected to reach 3.1 million by 2006. We can also measure the effect of this change on the large subgroup of occupations that include truck drivers—"operators, fabricators, and laborers."

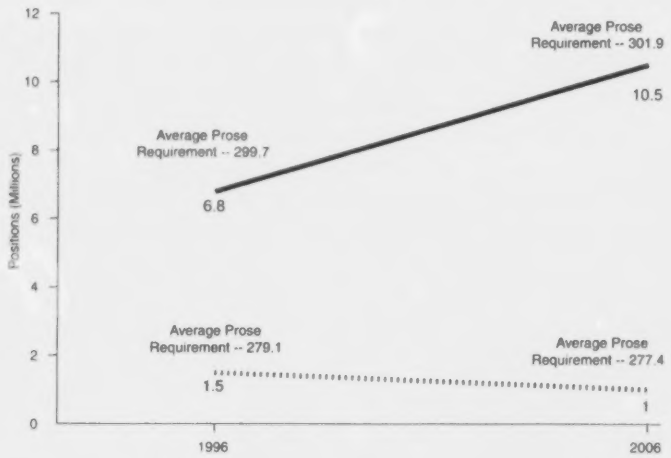
However, we have no measure of whether the literacy requirement to be a truck driver, for example, was different in 1986 than in 1996, or will change from 1996 to 2006, an issue we discuss in the section, "Putting it in Context." When changes in the content of jobs are very large, perhaps because of changes in technology, the result is frequently the creation of an occupation with a new title, rather than a large change within the previously existing occupation—although that may happen also. Occupations are being created and discarded, although large-scale changes of this kind do not likely happen within short-term time frames, such as the 20-year period being examined here. For example, farriers have been around for a long time, but in ever dwindling numbers.

Articles about past and future workforce trends frequently render conclusions about the direction or magnitude of change in education or skill requirements. The most frequently reported aspect is of the *fastest growing occupations*, often shown in terms of those occupations with the highest *percentage* increase. The projections for the 25 occupations with the highest percentage increase can be seen in Figure 1. These 25 occupations combined are expected to grow from 6.8 million in 1996 to 10.5 million in 2006, an increase of 69 percent. For these 25 occupations the combined average prose requirement was 300 in 1996, rising to 302 in 2006. This contrasts to an average score of 291 for *all* occupations in 1996. These 25 fastest growing occupations have a considerably higher prose, document, and quantitative literacy requirement than the average for all occupations.

Figure 1 also shows the 25 occupations with the largest percentage *decrease*, dropping from 1.5 million to 1.0 million between 1996 and 2006. For these jobs, the average prose requirement is below the national average. Jobs that are increasing have substantially higher prose/literacy requirements than jobs that are declining, with a net effect of raising average literacy

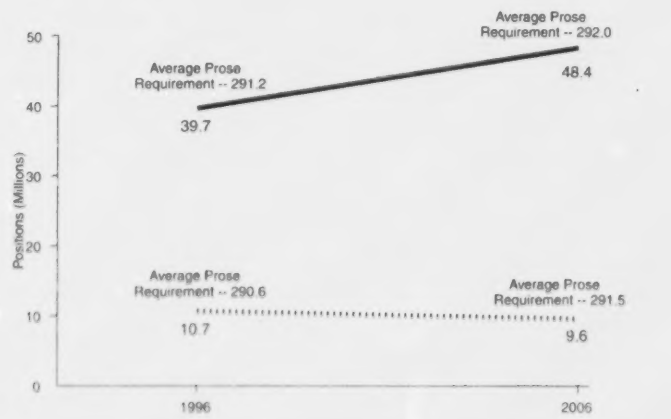
[9] For a recent analysis of the historical record on the accuracy of these projections, see "The Quality of BLS Projections: A Historical Account," Neal H. Rosenthal, *The Monthly Labor Review*, Volume 122, Number 5, May 1999.

Figure 1
25 Occupations with the Largest Percentage Increase and Decrease, 1996 to 2006



Source: The methodology used to create the data for this figure was detailed in the Introduction.

Figure 2
25 Occupations with the Largest Numerical Increase and Decrease, 1996 to 2006



Source: The methodology used to create the data for this figure was detailed in the Introduction.

requirements. However, the number of positions involved is relatively small (just over 10 million for those increasing and one million for those decreasing, out of a total of more than 150 million projected for 2006), so this change cannot affect the overall literacy requirements of the workforce. While these occupations do not have enough employment to change the average for the work-force as a whole, the information does have significance for career and education planning, and suggests the direction of change for the longer-term future.

The larger impact can be expected to come from the occupations that are growing the most in actual *numbers*, shown in Figure 2. The 25 occupations with the greatest growth are expected to increase from 40 million in 1996 to more than 48 million in 2006. This kind of growth can have a substantial impact on the entire distribution. However, the average literacy requirements are a bit *lower than* the overall averages, so this growth is not a source of increase in literacy requirements.

The 25 occupations with the largest expected numerical decline summed to 10.7 million in 1996 and 9.6 million in 2006; big declines are not expected. These declining occupations, on average, have literacy requirements almost identical to those of the occupations that are increasing, so on net these declining occupations have not affected the overall average requirements.

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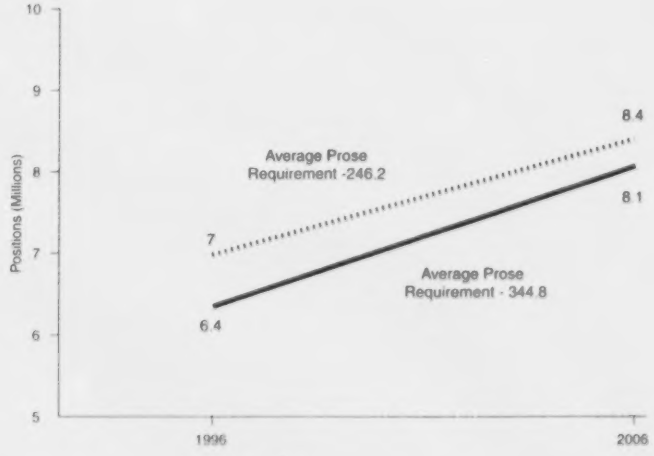
Many will be interested in what these rapidly growing occupations are, from the standpoint of education requirements and career planning. The fastest growing occupations, both in rate and number, are shown in Tables 1 and 2. Among those with the highest percentage increase are some occupations with much higher than average literacy requirements, such as computer scientists, computer engineers, and systems analysts. But the list also includes occupations substantially below the average in literacy requirements, such as home health aides, physical therapy aides, and amusements and recreational attendants. Most, though, are above the average.

Among those jobs that are growing most in numbers, reflective of the greatest job opportunities, are occupations on both ends of the literacy scale. Leading the job-growth list are "all other sales and related workers," with literacy requirements somewhat above the average, followed by cashiers, with requirements well below the average, followed by systems analysts, with requirements way above the average.

Another window into literacy requirements in the labor force is to look at the occupations with the highest prose requirements and those with the lowest. The 25 occupations with the highest prose requirements totaled 6.4 million in 1996, increasing to 8.1 million in 2006, for an increase of 27 percent. The average prose score for these 25 was 345. The 25 occupations with the lowest prose requirements totaled 7.0 million in 1996, rising to 8.4 million by 2006, for an increase of 20 percent. These 25 occupations had an average prose score of 246. *Both* those occupations with the highest literacy requirements and those with the lowest requirements are growing substantially in terms of numbers and are above the average growth for all occupations (14%), with occupations with the highest requirements, growing faster than those with the lowest requirements (see Figure 3).

The occupational classification system itself introduces problems in comparisons such as the above. Occupations that have lower literacy and educational requirements tend to be broken down into more detail than those at the top, affecting the comparisons in an artificial way. If broader occupational classifications are used, for example, the growth rate for the 25 with the lowest prose requirements would be substantially less

Figure 3
Occupations with the Highest and Lowest Literacy Requirements



Source: The methodology used to create the data for this figure was detailed in the Introduction.

Table 1
Top 25 Occupations with the Largest Percent Increase in Jobs, 1996 to 2006 (in thousands)

Occupation--Largest Percent Increase	Average Literacy Requirement			Number of Positions		Percent Increase
	Prose	Document	Quant.	1996	2006	
Database admin. support specialists, and computer scientists	351.0	362.0	354.0	212	461	**117.45%**
Computer engineers	333.0	327.0	338.0	216	451	**108.80%**
Systems analysts	352.0	347.0	352.0	506	1,025	**102.57%**
Physical and corrective therapy assistants and aides	266.0	268.0	264.0	85	151	**77.65%**
Home health aides	244.0	232.0	234.0	498	873	**75.30%**
Medical assistants	290.0	286.0	281.0	225	391	**73.78%**
Occupational therapists	320.0	314.0	315.0	57	95	**66.67%**
Occupational therapy assistants and aides	338.0	333.0	339.0	16	26	**62.50%**
Teachers, special education	325.0	316.0	324.0	407	648	**59.21%**
Medical records technicians	300.0	295.0	297.0	87	132	**51.72%**
Data processing equipment repairers	316.0	312.0	314.0	80	121	**51.25%**
Dental hygienists	325.0	309.0	313.0	133	197	**48.12%**
Amusement and recreation attendants	289.0	275.0	286.0	288	426	**47.92%**
Adjustment clerks	295.0	294.0	293.0	401	584	**45.64%**
Respiratory therapists	315.0	306.0	292.0	82	119	**45.12%**
Emergency medical technicians	333.0	326.0	308.0	150	217	**44.67%**
Bill and account collectors	299.0	294.0	304.0	269	381	**41.64%**
Residential counselors	334.0	325.0	337.0	180	254	**41.11%**
Instructors and coaches, sports and physical training	316.0	309.0	296.0	303	427	**40.92%**
Securities and financial services sales workers	328.0	316.5	329.0	263	363	**38.02%**
Teacher aides and educational assistants	284.0	271.0	276.0	981	1,352	**37.82%**
Dental assistants	276.0	268.0	263.0	202	278	**37.62%**
Flight attendants	321.0	315.0	311.0	130	178	**36.92%**
Child care workers	264.0	260.0	256.0	830	1,129	**36.02%**
Customer service representatives, utilities	294.0	289.0	294.0	152	206	**35.53%**
1996	**299.7**	**291.3**	**294.0**	**6,753**	**10,485**	**55.26%**
2006	**301.9**	**293.9**	**296.6**			

Note: There were a few occupations among the fastest growing 25 for which we do not have estimated prose literacy requirements, due to the small numbers in the occupation. These are the top 25 for which literacy scores are available.

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Table 2
25 Occupations with the Largest Increase in Numbers of Jobs, 1996 to 2006 (in thousands)

Occupation	Average Literacy Requirement			Number of Positions		Percent Increase
	Prose	Document	Quant.	1996	2006	
All other sales and related workers	300.5	295.0	301.0	3,503	4,314	23.15%
Cashiers	281.0	277.0	278.0	3,147	3,677	16.84%
Systems analysts	352.0	347.0	352.0	506	1,025	102.57%
General managers and top executives	324.7	314.2	330.4	3,210	3,677	14.55%
Salespersons, retail	292.4	290.8	294.8	4,054	4,481	10.53%
Registered nurses	320.3	313.0	306.0	1,971	2,382	20.85%
All other managers and administrators	323.4	315.9	325.7	1,981	2,387	20.49%
Truck drivers, light and heavy	268.3	268.7	276.7	2,717	3,123	14.94%
Home health aides	244.0	232.0	234.0	498	873	75.30%
Teacher aides and educational assistants	284.0	271.0	276.0	981	1,352	37.82%
Nursing aides, orderlies, and attendants	251.5	248.0	244.0	1,312	1,645	25.38%
Receptionists and information clerks	302.0	299.0	292.0	1,074	1,392	29.61%
Teachers, secondary school	334.0	327.0	333.0	1,406	1,718	22.19%
Child care workers	264.0	250.0	255.0	830	1,129	36.02%
All other helpers, laborers, and material movers, hand	255.0	254.3	258.0	1,737	2,012	15.83%
Clerical supervisors and managers	302.2	297.7	301.3	1,370	1,630	18.98%
Database admin., support specialists, and computer scientists	351.0	362.0	354.0	212	461	117.45%
Marketing and sales worker supervisors	295.7	289.0	298.1	2,316	2,562	10.62%
Maintenance repairers, general utility	291.0	288.0	292.0	1,364	1,608	17.89%
Teachers, special education	325.0	316.0	324.0	407	648	59.21%
Food counter, fountain, and related workers	251.0	249.0	257.0	1,723	1,963	13.93%
Computer engineers	333.0	327.0	338.0	216	451	108.80%
Food preparation workers	258.7	257.0	255.0	1,255	1,487	18.49%
Hand packers and packagers	250.5	250.0	261.0	986	1,208	22.52%
Guards	274.0	269.0	273.0	955	1,175	23.04%
Average Literacy Requirement **1996**	**291.2**	**286.4**	**291.3**	**39,731**	**48,380**	**21.77%**
Average Literacy Requirement **2006**	**292.0**	**287.1**	**291.9**			

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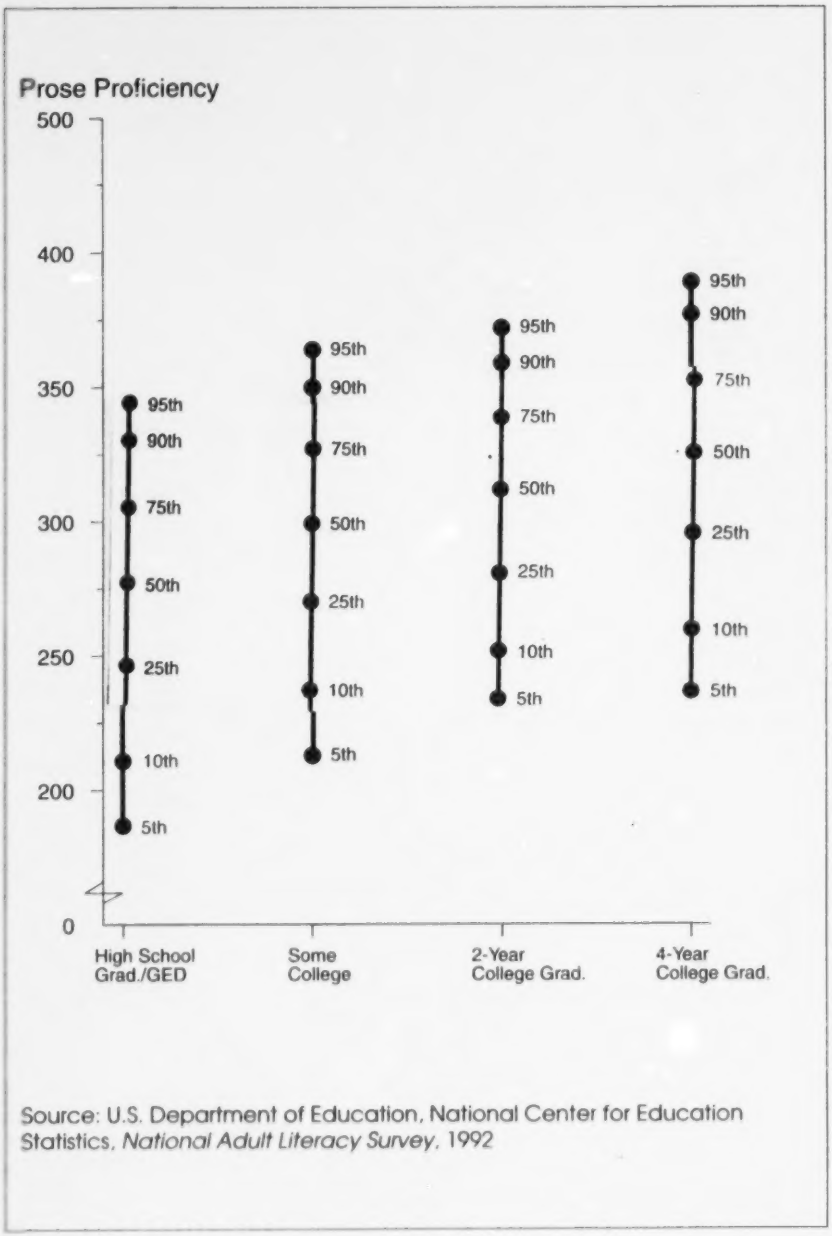
Section 3: Education, Training, and Occupations

The previous section addressed the literacy requirements of occupations. Here we look at the education and training levels typically required for employment in those occupations. Literacy level and formal education level are not the same thing, nor can formal levels of education be equated to levels of literacy. So, we must look at them separately. In any event, a person does not enroll in an education program to attain a particular scale score on the literacy assessment to qualify for a job; he or she goes to a community college or a four-year college. Literacy is *related* to years of education: the higher the education level, the higher the average literacy score, on average. But each category of educational achievement shows a wide dispersion of literacy scores.

This dispersion is shown in Figure 4. Prose proficiency is shown by percentiles for each level of education. The shaded area shows the large overlap in prose proficiency of different levels of educational achievement. A large proportion of adults *at all levels of education* are in the scale score range of from about 230 to 340. There are several reasons for this. First, the level of educational achievement varies depending on the individual and on the quality of the institution a student attended. Also, the literacy

Figure 4
Percentile Distribution of Prose Literacy Proficiency by Education Level, 1992



Source: U.S. Department of Education, National Center for Education Statistics, *National Adult Literacy Survey*, 1992

than what is reported here, where no such aggregation is employed.

In Table 3, we have summarized the information presented above in terms of the different sets of 25 occupations, their average literacy requirements, and the percent growth from 1996 to 2006, comparing them to the average for all jobs.

The final question is what is the overall net change from 1986 to 2006? The answer is that the many differences in the growth of individual occupations balance each other out, so that overall literacy requirements are stable over the 20-year period, from 1986 to 2006. (See chart above right.)

The above analysis is of the structure of the entire economy, of changes in literacy requirements as a result of change in the distribution of occupations. It does not answer the question of whether there are changes in the literacy requirements for those jobs *new entrants* to the labor force have taken, or will be taking, and this limits the data's usefulness for educational counseling. For example, new jobs accounted for only 14 percent of employment in 1996, and are projected to be 12 percent of employment in 2,006. If requirements were advancing or declining for these new jobs, it would have little affect on averages for total employment, over short periods of time. In the next section, we focus on "new job openings."

Average Literacy Requirements

	Prose	Document	Quantitative
1986	294	290	294
1996	295	290	294
2006	295	291	295

Table 3
Summary Comparisons of Average Prose Literacy Requirements, 1996

	Average Prose Requirements in 1996	Percentage Change, 1996-2006
25 Occupations with Highest Literacy Requirement	345	+27%
25 Occupations with Greatest Percentage Increase, 1996-2006	308	+55%
25 Occupations with Greatest Numerical Increase, 1996-2006	291	+23%
Average for All Occupations	**295**	**+14%**
25 Occupations with Lowest Literacy Requirement	246	+20%
25 Occupations with Greatest Numerical Decrease, 1996-2006	292	-32%
25 Occupations with Greatest Percentage Decrease, 1996-2006	291	-10%

Source: Complete data tables are in appendix.

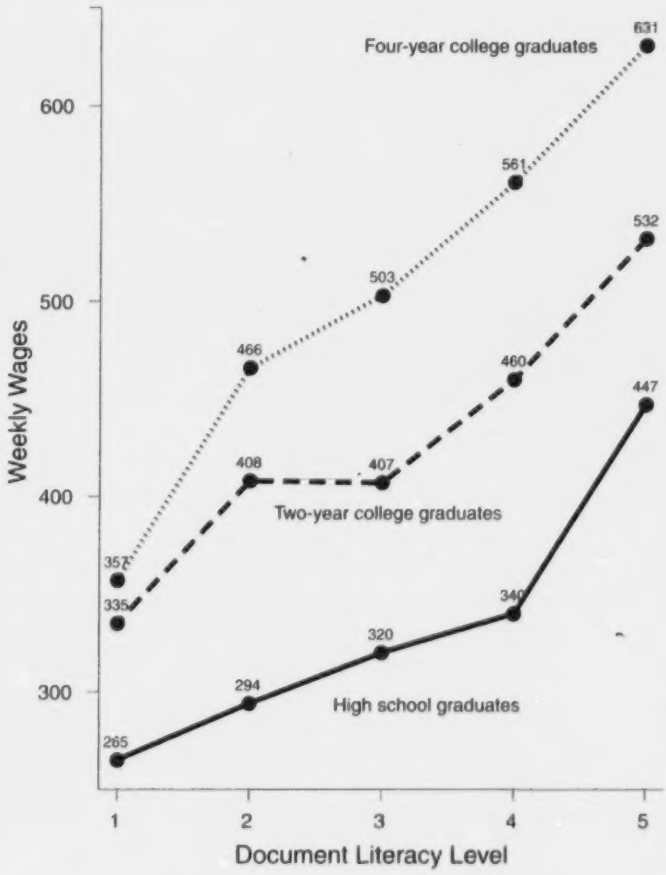
assessment measures proficiency in performing day-to-day real-world tasks, not proficiency with subject-matter material taught in schools. And different school subject areas will produce different proficiencies on the prose, document, and quantitative literacy scales. For example, a person with a degree in mathematics is likely to do better on the quantitative scale than would a student with a degree in art appreciation.

It is also interesting to note that earnings of adults vary with literacy proficiency, even within specific levels of education attainment. For example, individuals with a bachelor's degree who have higher literacy scores earn more than those who have lower literacy scores. This indicates that both education level and literacy proficiency level are important for success in the labor market. This can be seen clearly in Figure 5, which shows average weekly wages both by level of literacy proficiency and level of educational attainment.

The data used to examine educational requirements of occupations was obtained from the Bureau of Labor Statistics (BLS). The BLS has long had the *Occupational Outlook Handbook*, and makes available, in table format, the statistics it collects (or projects) for each of 510 occupations.[10]

The BLS identifies, for each occupation, "the education and

Figure 5
Document Literacy and Weekly Wages, by Education



Source: U.S. Department of Education, National Center for Education Statistics, *National Adult Literacy Survey*, 1992

[10] See *Occupational Projections and Training Data*, U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 2501, January 1998. Or go to the BLS Web site at *http://www.stats.bls.gov*.

training needed by most workers to become fully qualified." It shows the employment in that occupation in 1996, and projects it to 2006. Importantly, it also shows the annual average job openings "due to growth plus total replacement needs," as well as openings due to growth plus net replacement needs. According to the BLS, the first measure provides "the broadest measure of opportunities and identifies the total number of employees needed annually to enter an occupation." The analyses this author has seen, of growth and educational requirements, have all been of the average change in the employment level, or "net new jobs," rather than of job openings that come about from growth, turnover, and retirements. As we will see, these are quite different, and it is the *openings* that are important—no one gets hired for a "net new job."

A summary of the BLS data is provided in Table 4, showing, by training and education requirements, employment in 1996 and in 2006, and the numerical and percentage increases. Figure 6 compares employment, by education level and training requirements, in 1996 and 2006. An inspection of Table 4 shows that, generally, the occupations that have the *highest percentage increase* are those that require the most education, but those that have the greatest *growth in number of jobs* generally require the least education and training. An exception that stands out are jobs requiring a four-year college

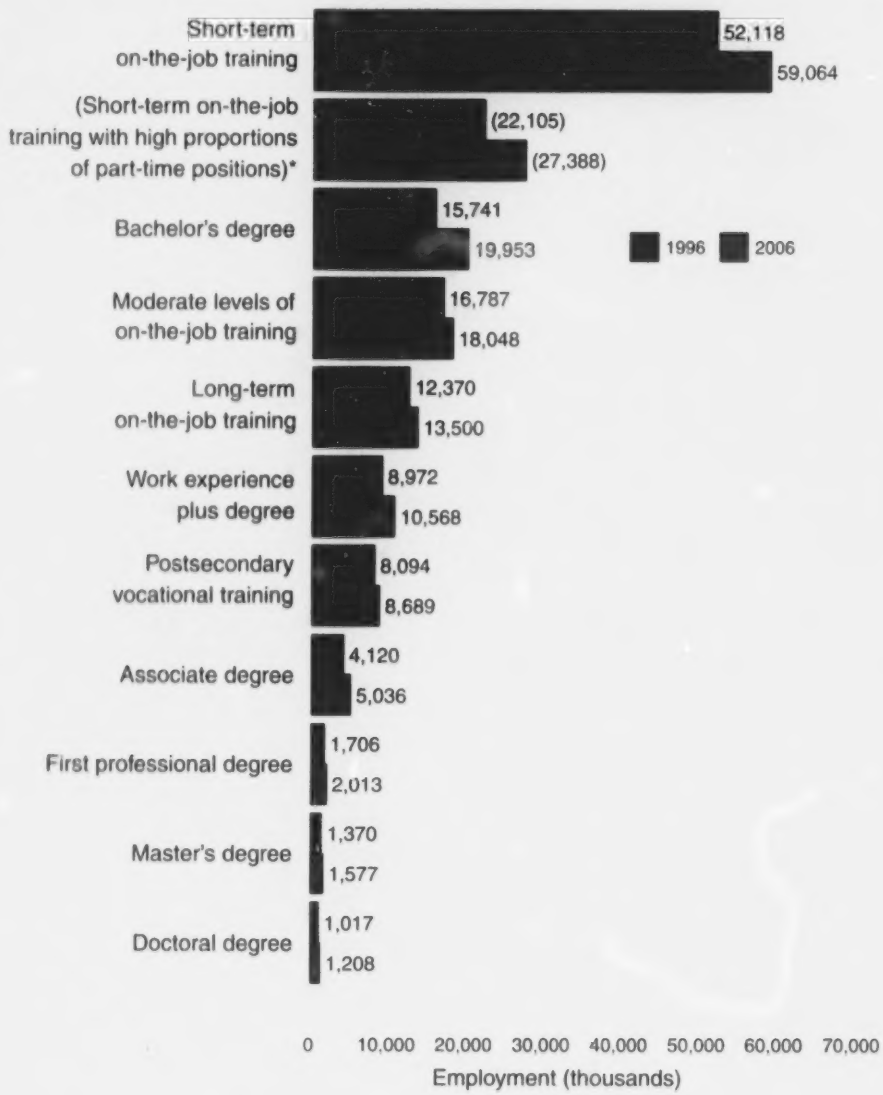
Table 4
Employment in 1996 and 2006, by Education and Training Level Typically Required

Training and Education Required	Total Employment (in thousands)		Change (in thousands)	Percent Change
	1996	2006		
Short-term on-the-job training	52,118	59,064	+6,946	+13.0%
(Short-term on-the-job training with high proportions of part-time positions)*	(22,105)	(27,388)	+5,283	+24%
Long-term on-the-job training	12,370	13,500	+1,130	+9.0%
Postsecondary vocational preparation	8,094	8,689	+595	+7.0%
Associate degree	4,120	5,036	+916	+22%
Work experience plus degree	8,972	10,568	+1,596	+18%
Bachelor's degree	15,741	19,953	+4,212	+27%
Master's degree	1,370	1,577	+207	+15%
First professional degree	1,706	2,013	+307	+18%
Doctoral degree	1,017	1,208	+191	+19%
Moderate levels of on-the-job training	16,787	18,048	+1,261	+7.5%
Total	122,295	139,656	17,361	+14%
Education/training Not Identified	10,058	11,271	1,213	+12%
Total employment	132,252	150,927	18,574	+14%

* Also included in Short-term OJT category

Source: U.S. Bureau of Labor Statistics, op. cit.

Figure 6
Employment in 1996 and 2006, by Education and Training Level Typicaly Required



* Also included in Short-term OJT category

Source: U.S. Department of Labor, Bureau of Labor Statistics, "Occupational Projections and Training Data, 1998-1999 Edition," Bulletin 2501. All data in the report are available at the BLS Web site, *http://www.stats.bls.gov.*

degree, which are expected to jump by 4.2 million, higher than any category except those requiring only short-term on-the-job training, with a projected increase of almost 7 million. This is the typical way of looking at changes in educational requirements, irrespective of how these requirements are measured.

Table 5 shows how the net change (all increases) in employment by education/training category compares with annual job openings—the measure that represents actual job openings is several times higher than the measure that reflects change in employment level. In other cases, job openings are lower than the change in employment level. The third column shows the ratio between the two. For example, for jobs requiring long-term on-the-job training, the openings are three times the employment change, while the openings for jobs requiring a first professional degree such as a law degree are less than a third of the employment change. This reflects differences in turnover in that occupational group, as well as differences in retirements expected.

For any one level of education and training, what portion of all new jobs does any one such level represent? That can be seen in Figure 7, which shows the distribution of "new jobs" by education/training level. Here, we see the difference these ratios, shown in Table 5, make. While jobs requiring only short-term on-the-job training account for 40 percent of the employment increase, they

Table 5
Average Annual Job Openings to Change in Total Employment, by Training and Education

Training and Education Required	Change in Total Employment (in thousands)	Average Openings 1996-2006	Ratio
Short-term on-the-job training	+6,946	+14,731	2.1
(Short-term on-the-job training with high proportions of part-time positions)*	(+5,283)	(+8,119)	1.5
Moderate levels of on-the-job training	+1,261	+3,025	2.4
Long-term on-the-job training	+1,130	+3,370	3.0
Postsecondary vocational preparation	+595	+1,067	1.8
Associate degree	+916	+468	.5
Work experience plus degree	+1,596	+1,178	.7
Bachelor's degree	+4,212	+2,199	.5
Master's degree	+207	+246	1.2
First professional degree	+307	+99	.3
Doctoral degree	+191	+150	.8
Total	+17,361	+26,533	1.5

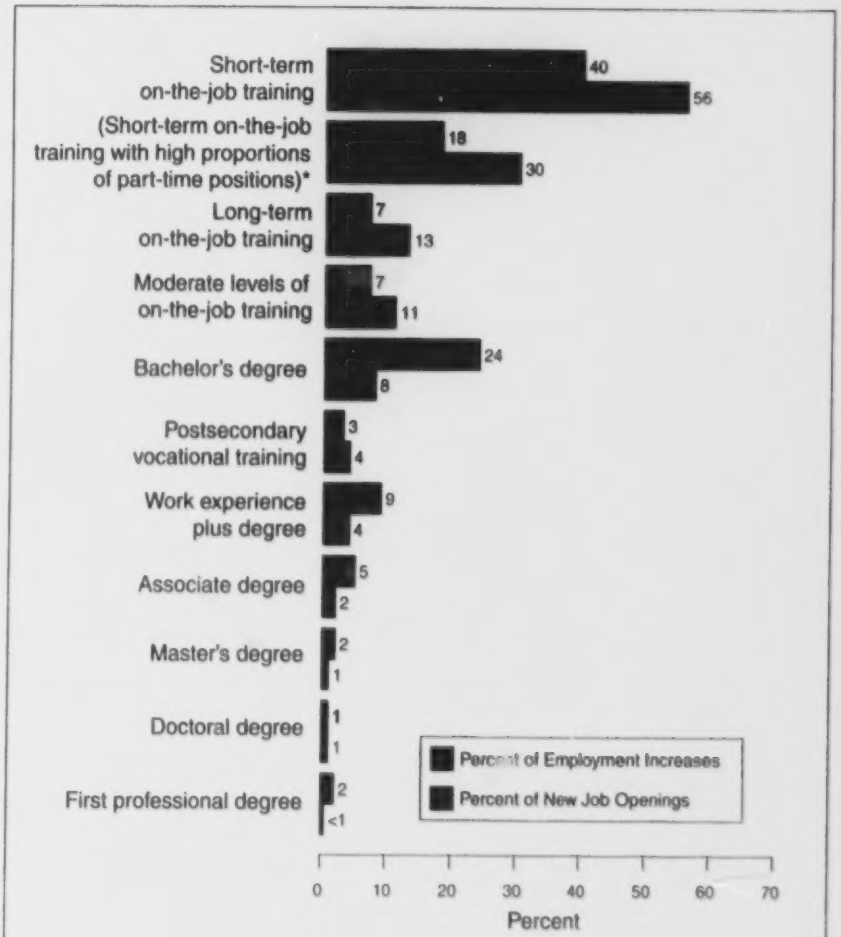
*Also included in Short-term OJT category
Source: U.S. Bureau of Labor Statistics, op. cit.

account for 56 percent of the new openings. Part-time jobs make up a high proportion of this category. The line underneath separates out the occupations with a very high proportion of part-time workers, with the percentages shown in parenthesis; they represent 18 percent of the employment increase and 30 percent of the annual job openings. Jobs requiring bachelor's degrees represent a whopping 24 percent of the employment increase, but just 8 percent of the annual job openings.

Figure 7 reveals that a modest proportion of annual job openings require advanced education, relative to the proportion they represent of the employment increase. Occupations requiring an associate degree or higher represent 43 percent of the net employment increase, but just 16 percent of annual job openings. The distinction does make a difference in the picture of education and training requirements and projected growth in opportunities. For comparison purposes, the statistics show that over a fourth of 25- to 29-year olds attain a bachelor's degree or higher, little changed in the last quarter century. Adding in associate's degrees would boost this to near a third.

In the above discussion, occupations have been aggregated by education/training requirement. In Table 6, all 25 occupations that have the highest numerical growth are shown, with the education/training requirement for each occupation.

Figure 7
Distribution of Employment Increases and Annual Job Openings, 1996-2006, by Training and Education Typically Required



* Also included in Short-term OJT category

Source: U.S. Department of Labor, Bureau of Labor Statistics, "Occupational Projections and Training Data, 1998-1999 Edition," Bulletin 2501. All data in the report are available at the BLS Web site, *http://www.stats.bls.gov*.

Table 6
25 Occupations with Greatest Numerical Growth, 1996 to 2006 Employment Job Openings, Typical Education/Training Level

Occupation	Total employment (in thousands)		1996-2006 Change in total employment		1996-2006 Average annual job openings (in thousands)		Education and training level
	1996	2006	Number (in thousands)	Percent	Due to growth and total replacement needs	Due to growth and net replacement needs	
All other sales and related workers	3,503	4,314	811	23.2	840	170	Moderate level of O-J-T
Cashiers	3,146	3,677	530	16.8	1,265	190	Short-term O-J-T
Systems analysts	506	1,025	520	102.8	133	55	Bachelor's degree
General managers and top executives	3,210	3,677	467	14.6	393	115	Work experience plus degree
Registered nurses	1,971	2,382	411	20.8	183	68	Associate degree
Salespersons, retail	4,072	4,481	408	10.0	1,272	170	Short-term O-J-T
All other managers and administrators	1,981	2,387	406	20.5	281	83	Work experience plus degree
Truck drivers, light and heavy	2,719	3,123	404	14.9	482	78	Short-term O-J-T
Home health aides	495	873	378	76.5	180	44	Short-term O-J-T
Teacher aides and educational assistants	981	1,352	370	37.7	296	50	Short-term O-J-T
All other service workers	1,112	1,453	341	30.7	302	62	
Nursing aides, orderlies, and attendants	1,312	1,645	333	25.4	340	51	Short-term O-J-T
Receptionists and information clerks	1,074	1,392	318	29.7	336	52	Short-term O-J-T
Teachers, secondary school	1,406	1,718	312	22.2	131	73	Bachelor's degree
Child care workers	830	1,129	299	36.1	322	39	Short-term O-J-T
All other helpers, laborers, and material movers, hand	1,737	2,012	275	15.8	598	86	Short-term O-J-T
Clerical supervisors and managers	1,369	1,630	262	19.1	202	58	Work experience in a related occupation

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Table 6
25 Occupations with Greatest Numerical Growth, 1996 to 2006 Employment Job Openings, Typical Education/Training Level, cont.

Occupation	Total employment (in thousands)		1996-2006 Change in total employment		1996-2006 Average annual job openings (in thousands)		Education and training level
	1996	2006	Number (in thousands)	Percent	Due to growth and total replacement needs	Due to growth and net replacement needs	
Database administrators, computer support specialists, and all other computer scientists	212	461	249	117.8	60	27	Bachelor's degree
Maintenance repairers, general utility	1,362	1,608	246	18.0	223	52	
Marketing and sales working supervisors	2,316	2,562	246	10.6	370	62	Work experience in a related occupation
Food counter, fountain, and related workers	1,720	1,963	243	14.1	841	125	Short-term O-J-T
Teachers, special education	407	648	241	59.1	49	30	Bachelor's degree
Computer engineers	216	451	235	109.1	59	25	Bachelor's degree
Food preparation workers	1,253	1,487	234	18.7	559	87	Short-term O-J-T
Hand packers and packagers	986	1,208	222	22.5	252	48	Short-term O-J-T

Source: U.S. Bureau of Labor Statistics, op. cit

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Section 4 :
Looking Backward

The previous two sections address the present, the recent past, and the future. What were the trends before this? How have skill and education levels changed since, say, the World War II period? There are reasonably good answers to those questions, within the limitations of the data sources available for analysis. While in many respects the data available for that time period is less adequate than recent data, the sophistication of the analysis at that time was more advanced than anything done since.

The principal work with which we will begin originated in a doctoral thesis by a student at Harvard, James G. Scoville, under the supervision of his adviser, John T. Dunlop, who is known (among many other things) for his work on the structure of jobs in firms and the U.S. economy. Scoville sets out to develop a methodology for analyzing the economy's job content,[11] and begins with a definition of job families and clusters formulated by Dunlop, for application at the factory level:

> [It] is a stable group of job classifications or work assignments within a firm ... which are so linked together (a) by technology, (b) by the administrative organization of the productive process, including policies of transfer and promotions, or (c) by social custom that they have common wage-making characteristics.[12]

Scoville applies his methodology to the available data, although his aim is to stimulate better data collection and classification by the Census Bureau that would be more reflective of job content.

Scoville started with a different and expanded set of job families than was used by the Census, trying to achieve more homogeneous groupings. He arrived at the following 15:

Tools
- a. specialized
- b. non-specialized

Machines and Equipment
- a. specialized
- b. non-specialized

Inspection
Vehicle Operation
Farming
Sales
- a. considerable knowledge of product
- b. little knowledge of product

Clerical
Personal Services
Entertainment
Protection
Education and Training
Health Services
Welfare Services
Administration and Organization
Research and Design

Having done this, Scoville asked the next question: "Can content levels be defined within [these] job families which are in some way comparable so they can be summed across job families?" To do so, he would have to develop a description of job requirements. And the only useful/available source for this information was an ambitious undertaking of the United States Employment Service in its analysis of jobs drawn from its Dictionary of Occupational Titles (DOT), and entitled *Estimates of Worker Traits Characteristics for 4,000 Jobs*, published in 1956. The jobs were rated for a number of characteristics, including aptitude, interests, temperaments, training time required (general and specific), as well as level of general education development. The 11 aptitudes referenced in this study included general intelligence, verbal ability, numerical ability, and spatial perception.

Scoville put these 4,000 jobs into his revised classification of Census jobs. These characteristics, he thought, should be related to "the sorts of training, abilities, skills, and responsibilities for which wages are presumably the reward," and he proceeded to estimate the market value for each

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[11] James G. Scoville, *The Job Content of the U.S. Economy, 1940-1970*, A Wertheim Committee publication, McGraw-Hill Book Company, 1969.

[12] John T. Dunlop, "The task of contemporary theory," in John T. Dunlop (ed.), *The Theory of Wage Termination*, London, Macmillan Co., 1957.

characteristic through a regression of such requirements on 1960 median occupational earnings.

The resulting analysis yielded an explanation of 33 percent of the variation in wages, and when other requirements were added (such as age—as proxy for experience—desired by employers, for example) the model explained about 60 percent of the variation. This, then, became the basis for differentiating job content within job families, and permitted regrouping across job families on the basis of estimated content levels. Scoville regrouped the jobs into five levels.[13]

Further, Scoville applied his estimating process to the occupational projections for 1970, using those of the National Planning Association. The following summary table results.

Table 7 shows a continual and gradual increase in the jobs with the highest content (Levels I and II), and corresponding decline at the bottom (Levels IV and V).

As noted above, the worker trait study included analysis of the required general educational development (GED) and years of specific vocational preparation (SVP). The GED is expressed in a scale but was converted to years of school by Richard S. Eckaus (see Table 8).[14]

Table 7
Job Content Levels, 1940-1950 (percentage)

Content Level	1940	1950	1960	1970 Projected
I	6.1	6.8	8.7	9.4
II	9.6	11.5	14.2	16.1
III	28.5	32.5	34.2	34.7
IV	24.5	20.8	17.0	15.8
V	31.6	28.4	25.9	24.0

Note: Level I is highest in skill content.

Table 8
General Educational Development, Specific Vocational Preparation Requirements, and Job-Content Levels, 1940-1970

(Number of years required for general educational development)

Content Level	1940	1950	1960	1970 Projected
Total	9.99	10.14	10.37	10.49
I	16.31	16.21	16.17	16.11
II	12.01	12.04	12.11	12.17
III	10.54	10.50	10.46	10.43
IV	9.75	9.63	9.48	9.43
V	7.85	7.89	7.93	7.96

(Number of years required for specific vocational preparation)

Content Level	1940	1950	1960	1970 Projected
Total	1.78	1.82	1.86	1.88
I	5.40	5.30	5.27	5.23
II	3.21	3.19	3.18	3.19
III	1.92	.82	1.63	1.49
IV	1.40	1.29	1.12	1.03
V	.82	.81	.80	.79

Source: Scoville, op.cit.

[13] Occupations with regression estimates more than three standard deviations above the mean were placed in Level I, and those more than three standard deviations below were placed in Level V. Those between were divided roughly into three equal parts.

[14] Richard S. Eckaus, "Economic criteria for education and training," *Review of Economics and Statistics*, May 1964.

Again, we see a gradual rise in the average education and training required for total employment, although there were generally decreases within the five levels. The greater growth in the higher content levels accounts for the rise in the average, while a changing composition within the levels accounts for changes in averages for each level. Scoville-Eckaus estimate an increase from 10 years of education required, on average, in 1940, to 10.5 years in 1970—a very modest rise. During that general period, the mean educational attainment of men rose from 8.6 years to 12.0 years, and for women from 9.8 years to 12.1 years.

In the recent past, the most widely quoted study of changing educational requirements of jobs was the 1987 report *Workforce 2000*, by William B. Johnston and Arnold H. Packer.[15] Johnston and Packer performed an analysis using the GED scale used in the U.S. Department of Labor's *Dictionary of Occupational Titles* (DOT), marrying that information to occupational data and projections provided by the U.S. Bureau of Labor Statistics. As is frequently the case in such presentations, the analysis presented in the text of *Workforce 2000* was of the most rapidly growing (in percentage terms) and most rapidly declining occupations. In this respect, the findings were similar to those in this report that use the data from the National Adult Literacy Survey and the Position Analysis Questionnaire—that the fastest growing occupations had higher requirements than the declining ones. *Workforce 2000* summed it up this way: "Ranking of all jobs according to the skills required on a scale of 1 to 6, with 6 being the highest level of skill, indicated that the fastest-growing jobs require much higher math, language, and reasoning capabilities than current jobs, while slowly growing jobs require less."

This author had looked closely at the *Workforce 2000* analysis when writing *Workplace Competencies: The Need to Improve Literacy and Employment Readiness*, with Irwin Kirsch.[16] This work was commissioned and published by the U.S. Department of Education's Office of Educational Research and Improvement. While the detailed results of the *Workforce 2000* analysis were not published in the report, they were available, and I requested and received them. The question was this: Was this difference in these fast-growing and fast-declining occupations, a small percentage of total employment, enough to make any substantial difference in the total picture for all employment in the period from 1984 to 2000 (the period used in the *Workforce 2000* projections)? On a scale of 1 to 6 for educational development requirements, the average for all jobs in 1984 was 3.0; for the year 2000 it was projected to be 3.1, a difference so small as to be well within the margin of error in the projections, and in the measures of educational requirements. While this Hudson Institute report has been frequently cited as saying education requirements were advancing rapidly, the analysis itself was very consistent with that performed for this report; but no one seems to have looked at the underlying analysis. The information provided about those fast-growing jobs is useful to have, even if their numbers are relatively small, but it is important to have the full picture.

In September 1988, the Employment Standards Administration of the U.S. Department of Labor issued a report titled *Opportunity 2000: Creative Affirmative Action Strategies for a Changing Workforce*, prepared for the department by the Hudson Institute. It states (p. 14) that "while most new jobs—especially those in the fastest growing categories—will demand much higher language, math and reasoning skills than many current jobs, the opposite is true for slower-than-average-growth job categories." Again, no mention of the overall employment picture is made, nor is there any mention that these

[15] William B. Johnston and Arnold H. Packer, *Workforce 2000*, Indianapolis, Hudson Institute, 1987.

[16] *Workplace Competencies: The Need to Improve Literacy and Employment Readiness*, Paul E. Barton and Irwin S. Kirsch, Office of Educational Research and Improvement, U.S. Department of Education, 1990.

requirements were estimated to remain unchanged. The citation is from the *Workforce 2000* report.

The *Workforce 2000* analysis has another characteristic that makes such a conclusion problematic. It looks at net changes in average employment, the difference between the job growth and the job decline. But no one gets a "net new job." Job openings are a function of turnover—of job changers, of those entering the labor force, and of those retiring from it. To look at job opportunities one has to look at the annual job openings becoming available, and then at the requirements for these openings. This is the approach in the BLS analysis of job preparation requirements described in the section above, titled, "Education, Training, and Occupations."

In 1997, the Hudson Institute updated *Workforce 2000* with *Workforce 2020*.[17] A similar analysis was performed, and concluded, "In short, shrinking occupations overwhelmingly require modest skills, but high skills are called for by a significant component of the expanding occupations. The words of *Workforce 2000* still ring true ..." No information was provided for the entire workforce for this period of time.

Russell W. Rumberger and Henry M. Levin have several times examined educational requirements of jobs. In 1989, in *Schooling for the Modern Workplace*, their principal conclusion was:

> *The average educational requirement of future jobs will not be significantly different than current jobs, as both high-skilled and low-skilled jobs will continue to exist in the future economy.*[18]

At various times over the past 25 years, this author has examined the studies available, and concluded that a very gradual shift was likely taking place toward higher requirements, but nothing drastic. Comparison of these shifts to the increasing educational-level schooling of the population suggested no reason why adjustment would not be smooth, in these terms, at least.[19]

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[17] Richard W. Judy and Carol D'Amico, *Workforce 2020: Work and Workers in the 21st Century*, Indianapolis, IN, Hudson Institute, 1997.

[18] *Schooling for the Modern Workplace*, Russell W. Rumberger and Henry M. Levin, prepared for the U.S. Department of Labor, Commission on Workplace Quality and Labor Market Efficiency, Washington, D.C., 1989.

[19] Paul E. Barton, "Human Resources: The Changing Labor Market, and Undergraduate Education," *Liberal Education*, May 1975. (Papers from the 61st Annual Meeting of the Association of American Colleges.)

Section: 5

Putting it in Context

One of the largest limitations of all the studies presented or cited in this report is that they are dealing with the effect of compositional shifts *among* occupations. As was discussed in Section 2, these shifts do not affect changes in literacy requirements *within* an occupation over time. Similarly, examinations of small sectors of the workforce cannot disclose what is happening in the entire workforce. Observing these trends over the years, one gets the impression that some jobs change to require more knowledge and skills, some change to require less, and some change their requirements very little. And for some workforce sectors, work tasks within an occupation may get more complex, while others get simpler.

For example, a clerk in a drug store in the 1940s would have found the items for a customer, added their prices by hand, and computed the tax and the change. The money that paid for the sale may have to gone into different drawers in the cash register. This author, when a clerk in such a drug store, also checked in the daily order from the wholesaler and put the retail price on the item. The markup was "one-third of the selling price," which the clerk (this author) was expected to calculate. These exercises, particularly the last one, would be fairly high on the quantitative literacy scale. In the 1990s, the customer finds the merchandise, the scanner automatically inventories the item and registers its price, and the cash register computes the change. At a McDonald's the counter person pushes buttons on the cash register that have pictures of the items. At Jewell food market in Illinois, the cash register (not the clerk) says, "Thank you, have a nice day."

Secretaries now have to know how to use a personal computer and understand word-processing software, and are expected to learn ever-changing versions of software packages, or to learn different word-processing programs. But the computer does the spell checking, and more bosses are entering their own drafts into the computer rather than dictating to a secretary. Maintenance repairers are likely dealing with much more complex equipment—a touchy copying machine or an appliance full of computer chips—and with technology that is constantly changing. Conversely, one of the occupations with the highest growth in numbers, truck drivers, probably takes no more time to learn today than it did 20 years ago.

Further, it is one thing to analyze an occupation through traditional job analysis techniques. It is another to determine what employers are actually looking for. An example is Laurie Bassi's point that "it is not clear whether employers are increasingly relying on education credentials as a method of screening for the skills they need, or whether these credentials are merely a proxy for increasing importance for some necessary skill (perhaps the ability to learn quickly)."[20]

A lot of attention has been given to the trend of constantly rising skill requirements. It is a refrain heard over and over again. But since the industrial revolution, there has also been a trend of de-skilling jobs. The computer chip is likely skilling some jobs and de-skilling others. I see little evidence that one of these trends has predominated over the past several decades.

Of course, when job requirements change drastically as a result of technological or other changes, the name of the occupation itself often changes. Some occupations disappear while others are created. All in all, it is not at all a simple matter to track the education and training requirements for entry into the U.S. workforce. We do know that in the past several decades there have been large increases in the total number of bachelor's degrees conferred, more than doubling since 1965, and rising by almost a fourth since 1975. In the same period, awards of associate degrees advanced fivefold, from more than 100 thousand to more than 500 thousand. Since 1975, the proportion of all adults with four years of

[20] Laurie J. Bassi, "Are employers' recruitment strategies changing?: Competence over credentials," in *Competence Without Credentials*, Nevzer G. Stacey, Project Manager, U.S. Department of Education, March 1999.

high school or more has risen from 63 percent to over 80 percent. The economy has absorbed the increases. While we will make no attempt here to match educational attainment and job requirements over this long period in any precise way—a task fraught with difficulties and pitfalls—we *will* make some observations.

In this process of absorption, what has been happening, decade by decade, is that more people with higher levels of education are in occupations that in the prior decade were occupied by those with less education. So college graduates are in occupations formerly occupied by high school graduates, and high school graduates are in jobs formerly occupied by people without a high school diploma. This trend was observed by demographers John Folger and Charles Nam in 1964.[21] A decade later, Douglas Adkins found that "if we take the 1940 level of educational attainment in individual occupations and (roughly) calculate the proportion of the total number of male college graduates in 1969 that would be needed to meet 1940 educational attainment standards for occupations, we will account for only 45% of the stock of male college graduates in 1969."[22]

It is relatively simple to look at occupational titles and see that people in those occupations in prior years had less educational attainment than those in later years. But we don't know whether skill requirements for some of those jobs rose, or whether the more highly educated workers were more productive and therefore paid more. In the mid-1990s an attempt was made by Daniel E. Hecker, of the U.S. Bureau of Labor Statistics, to examine such trends, from 1970 to 1990. He pointed out, "It is not possible to precisely identify and measure the number of jobs that *require* a college degree." To make his estimates, he used surveys that asked workers what level of education they needed to qualify for their current jobs. In his analysis, he concluded that the percent of college graduates who were either in jobs that "do not require a college degree or are unemployed" rose from 11.7 percent in 1967 to 19.9 percent in 1990. He asks, "If as some analysts contend, the rising relative wages of college graduates in the 1980s suggest a shortage of these workers, why did one-fifth of them accept jobs that traditionally don't require a degree for entry?"[23]

In 1995, John Tyler, Richard Murname, and Frank Levy responded with an analysis that included a re-analysis of the data Heckman had used. They contested his claim that the demand for college graduates was weak in the 1980s, finding that the increase in taking jobs with less than college requirements had mostly occurred in the 1970s, when the economy was absorbing college graduates of the baby boom. From this and analysis of income changes, they concluded that "the labor market of the 1980s successfully absorbed new college graduates, even as the overall college labor supply rose by 60 percent."[24] In his reply, Hecker pointed out some problems he had with the data Tyler, et al. used, but noted that they had agreed that about 25 percent of young college graduates were taking such jobs, and asked, "given the high and rising relative earnings of college graduates, why do so many end up taking lower level jobs?"[25]

Not only has the economy absorbed the increasing number of college graduates, these college

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[21] John K. Folger and Charles B. Nam, "Trends in education in relation to occupational structure," *Sociology of Education*, Fall 1964, p.p. 19-33.

[22] Douglas Adkins, "The American educated labor force: An empirical look at theories of its formulation and composition," *Higher Education and the Labor Market*, Margaret Gordon, ed. Carnegie Commission on Higher Education.

[23] Daniel E. Hecker, "Reconciling conflicting data on jobs for college graduates," *Monthly Labor Review*, July 1992.

[24] John Tyler, Richard J. Murname, and Frank Levy, "Are more college graduates really taking 'high school' jobs?" *Monthly Labor Review*, December 1995.

[25] A commentary by Daniel Hecker, *Monthly Labor Review*, December 1995.

graduates have also prospered in relation to those with less education. Ultimately, it is the labor market that places the economic value on the level of educational attainment, not analytical studies of "real" job requirements. When employers in the 1980s hired college graduates for jobs previously filled by high school graduates, they found reason to pay them at a higher rate (at least relatively). There has been a clear demand shift toward college graduates; what is unclear is the reason why this has happened. This shift can be seen in Table 9.

Table 9
Percent Change in Real Hourly Wage by Education, 1973-1995[26]

Education	Men	Women
Less than high school	-28	-7
High school	-19	-3
Some college	-15	-1
College	-4	+8
Advanced degree	+12	+6

Combining men and women, only those with a college degree gained in real earnings over the past quarter century. All the rest lost ground, including those with "some college." Women fared much better than men, gaining 8 percent among those with college degrees. College men, in this set of statistics, lost a little ground, unless they had advanced degrees. Men's losses for educations below the college level were huge. While there is agreement that the relative changes are about as shown in Table 9, comparisons of different time periods, and the use of different Census samples, produce varying estimates of the absolute changes in the earnings of college graduates. For example, from 1974 to 1997 the mean annual earnings of all males with a bachelor's degree only, age 18 and over, working full time for a full year, rose from $53,407 to $55,832 (in 1997 dollars).[27]

The reasons for these market results are not at all clear. The decline in real wages coincided with the decline in productivity, beginning in 1973. Productivity declines induce earnings declines, and the workers without college degrees bore the brunt of these declines. Economists do not understand *why* productivity growth rate declined. Nor do they understand how, in the past several years, we have been able to have continued economic growth without inflation.

The economist Laurie J. Bassi, vice president for research at the American Society for Training and Development, recently examined this labor market history and concluded that "very little is known on a systematic basis that enables us to identify in a rigorous manner exactly what is behind the shift in demand for educated workers." What we do know, she says, suggests the following conclusions:[28]

> First, education credentials are an increasingly important determinant of demand for labor, which in turn, affects wages. Second, it is not clear whether employers are increasingly relying on education credentials as a method of screening for the skills they need, or whether these credentials are merely a proxy of increasing importance for some necessary skill (perhaps the ability to learn quickly). Third, the demand (as evidenced by the growing wage premium) for mathematics skills has grown. It may be that these skills serve as a proxy for some other important skill (such as problem-solving ability). Fourth, since wage inequality has also increased *within* educational categories, some aspect of supply and demand (above and

[26] Lawrence Mishel, Jared Bernstein, and John Schmidt, The State of Working America 1996-97, Armonk, M.E. Sharpe, Inc., 1997 (reproduced in Laurie J. Bassi, 1999, op cit).

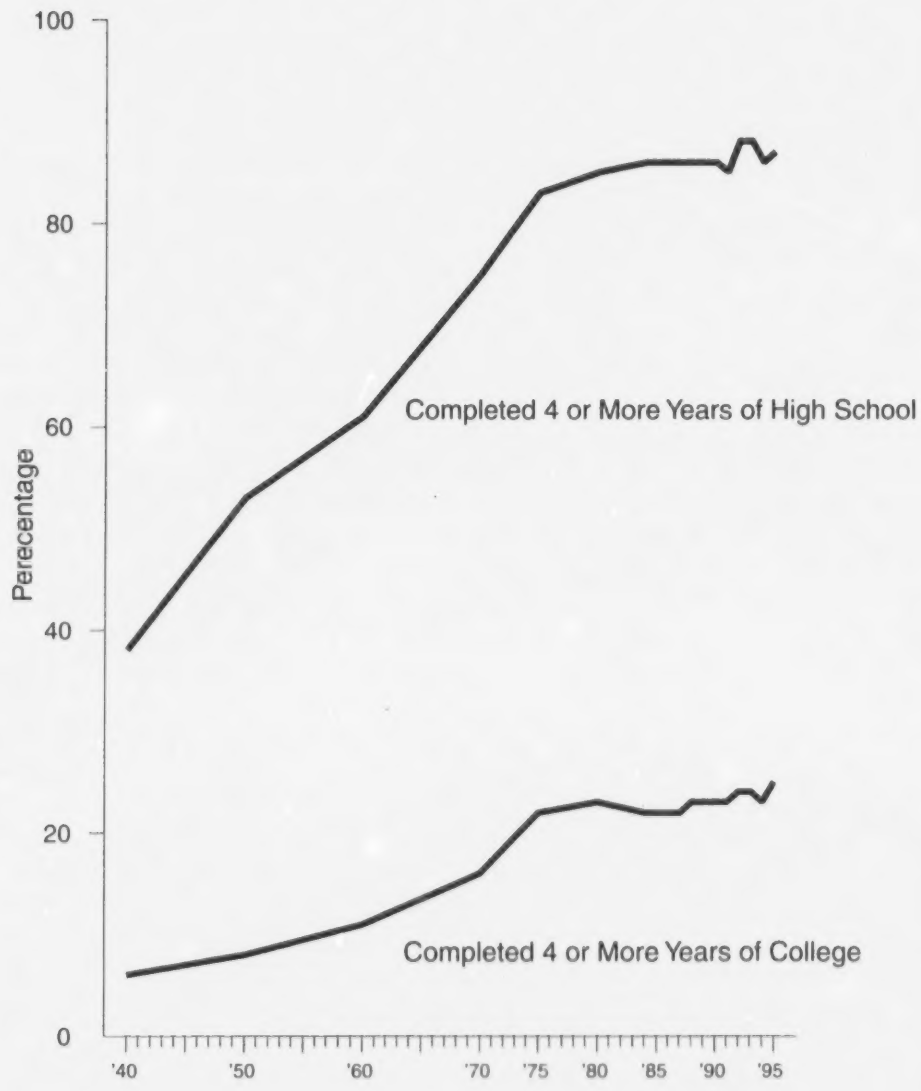
[27] Donna Desrochers, personal correspondence, September 24, 1999 (using March CPA data in the U.S. Census Bureau Historical Income Table).

[28] Laurie J. Bassi, op. cit.

beyond educational credentials) is at work in the labor market. This could be some unmeasured competencies. Or it could be luck. Or it could be something else. Fifth, the use of computers is likely to be an important part of the "something else." Finally, it is simultaneously true that both educational credentials and something beyond educational credentials have become increasingly important in determining employers" demand for workers, and therefore, the wages that workers earn. It is likely that both competence and credentials are increasingly in demand by employers.

To add to the puzzlement, the favorable treatment of those with a college degree has not resulted in a higher proportion of young people getting one. There may have been a *shift* in demand, but it is hard to see that demand, overall, has been rising. After all, we are doing little more than maintaining real wages for college graduates, not increasing them, which would be expected if there was a growing demand. True, more young people have been *enrolling* in college, but more have not been completing college, at least until the past couple of years. This can be seen in Figure 8. For the past quarter century, the figures for those getting a four-year college degree or better have remained stable. Around a quarter of 20- to 29-year-olds have been getting four-year degrees, or better, after a sustained period of increase. (However, there has been a slight increase recently, from 25 percent in 1995 to 27 percent in 1996 and to 28 percent in 1997, suggesting some responses to earlier increases in relative earnings.) Moreover, the proportion of those getting at least a high school education has also been stable for this period of time, after rising throughout our history. In the 1990s, the high school completion rate, in terms of getting a diploma in four years at age 17 or 18, has actually fallen. With so little understanding of why the demand for education is behaving as it is, and with no discernable shift toward occupations that require higher literacy or education, we need to be cautious about predicting the future. About all we can say is that in the recent past earnings of college graduates have exceeded earning of those with less education by wider margins.

Figure 8
Percentage of 25- to 29-Year-Olds Completing High School and College, 1940-1995



Source: *Digest of Education Statistics, 1996*. National Center for Education Statistics, p. 17.

Section 6:
The Bottom Line

Literacy, 1986 to 2006

- While the fastest-growing jobs, in terms of percentage increases, have higher literacy requirements than those decreasing, the numbers are relatively small. However, it is in these growing areas that new opportunities are being created for young labor market entrants.

- The largest growth in terms of *numbers of jobs* is in occupations with slightly lower average literacy requirements than for all "occupations." Literacy requirements for these 25 growing occupations is about the same as the 25 with the greatest decline in numbers.

- Those occupations with the highest literacy requirements and those with the lowest are *both* growing at rates well above the average, resulting in little net effect on overall literacy requirements.

- Averaging all occupations, the literacy requirements in 1986, 1996, and 2006 were the same. This reflects taking into account changes in the distribution of occupations, due to differences in their relative growth. However, with the fastest-growing occupations having literacy requirements higher than those declining, the bias, over long periods of time, is likely toward increasing skill requirements.

- Literacy requirements are examined from the standpoint of changes resulting from different growth patterns among occupations. Information about the net effect of changes *within* occupations is not available.

Education and Training, 1984 to 2006

- Estimates were published in 1988 showing that average General Education Development, on a scale of 1 to 6, would be 3.0 in 1984 and 3.1 in 2000, basically unchanged. However, as was found in literacy, the occupations with the highest growth, in percentage terms, had higher than average education requirements.

- While past studies have looked at projections of average employment, the more useful approach is using annual job openings, taking into account growth, turnover, and retirements.

- The distribution of the *increase* in annual job openings, from 1996 to 2006, by the level of preparation required (as judged by the Bureau of Labor Statistics) is detailed in the chart below:

Level of education required (According to Bureau of Labor Statistics)	**Percentage of increase in job openings, 1996-2006**
Short-term on-the-job training	56%
Long-term on-the-job training	13%
Moderate-term on-the-job training	11%
Bachelor's degree	8%
Postsecondary vocational training	4%
Work experience plus degree	4%
Associate degree	2%
Master's degree	1%
Doctoral degree	1%
First professional degree	<1%
Total	100%

Job Content and Education, 1940 to 1970

- Jobs with the highest skill content grew more rapidly than those with the lowest, causing a gradual rise in skill content over these decades.

- Estimates are that the average years of schooling actually required for jobs rose from 10.0 in 1940 to 10.5 in 1970. During this period, the mean educational attainment of men rose from 8.6 years to 12.0 years, and for women from 9.8 years to 12.1 years.

* * *

Piecing together the several in-depth studies and analyses, the following can be said. Based on market valuation of a large set of worker traits identified with different jobs, the "skill content" of jobs advanced gradually from 1940 to 1970. Based on the job analysis approach, the average education required for jobs advanced very modestly in the same period, from 10 years to 10 1/2 years; the actual educational attainment of adults considerably exceeded both the increase and the educational level. Analyses and projections of educational *requirements* from the mid-1980s all show no change, on the average, including projections out to 2006. However, the rapidly increasing jobs, in percentage terms, have higher requirements, so the long-term bias is toward higher literacy requirements. The proportion of the increase in annual job openings (1996-2006) that require an associate degree or higher is just 16 percent. An additional 4 percent require advanced vocational preparation, and the rest require short-term, medium-term, or long-term on-the-job training, in the judgement of the U.S. Bureau of Labor Statistics.

However, who employers decide to actually *hire* is sometimes different than suggested by job analysis, and over the past 25 years, employer demand has shifted toward higher educational requirements, as revealed by falling relative incomes of those with less than a four-year college degree. Thus, the past is hard to interpret as to what accounts for employer behavior, and employer preference over the next four years may stay with the more highly educated, irrespective of projections that show such a high proportion of openings not needing people with college degrees, and stability in the average literacy requirements of jobs.

Appendix A:

Detailed Table Showing Prose, Document, and Quantitative Literacy by Occupation for, 1986, 1999, and Projected to 2006

Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Total, all occupations	294.0	289.5	293.8	294.5	290.0	294.1	295.3	290.7	294.8	111,074	132,015	150,492	18,477	14.00%
Executive, administrative, and managerial occupations	324.4	316.8	326.6	324.4	316.6	326.7	324.4	316.6	326.7	10,569	13,568	15,566	2,331	17.14%
Professional specialty occupations	331.7	324.6	336.2	331.1	323.9	337.2	331.6	324.6	337.8	13,586	18,176	22,996	4,820	26.52%
Technicians and related support occupations	310.7	306.2	304.8	311.2	306.8	304.7	311.2	306.3	304.4	3,423	4,595	5,501	906	20.61%
Marketing and sales occupations	294.3	289.9	298.0	293.1	288.7	293.7	293.2	288.7	293.7	11,499	14,616	16,898	2,282	15.61%
Administrative support occupations, including clerical	293.3	288.1	290.6	294.4	289.8	291.6	294.7	289.8	291.8	30,872	34,023	35,828	1,805	7.51%
Service occupations	270.0	266.1	266.2	269.7	268.7	268.8	269.5	268.3	268.6	17,427	21,317	25,144	3,827	17.99%
Agriculture, forestry, fishing, and related occupations	274.6	269.9	278.2	274.6	270.4	278.7	278.1	271.0	276.3	3,660	3,788	3,823	35	0.92%
Precision production, craft, and repair occupations	285.9	284.5	290.5	286.0	284.5	290.4	285.8	284.3	290.2	13,831	14,661	15,648	987	6.83%
Operators, fabricators, and laborers	264.5	263.4	270.5	264.5	263.5	270.6	264.3	263.4	270.4	16,207	17,694	19,188	1,494	8.44%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Executive, administrative, and managerial occupations	**324.4**	**316.8**	**326.6**	**324.4**	**316.6**	**326.7**	**324.4**	**316.6**	**326.7**	**10,569**	**13,545**	**15,866**	**2,321**	**17.14%**
Managerial and administrative occupations	324.0	315.0	327.3	324.2	315.1	327.5	324.3	315.2	327.5	7,374	9,541	11,262	1,721	18.04%
Management support occupations	325.2	320.5	325.0	324.7	319.9	324.9	324.6	319.7	324.8	3,195	4,004	4,604	600	14.99%
Professional specialty occupations	**331.7**	**324.5**	**328.2**	**331.1**	**323.9**	**327.2**	**331.6**	**324.6**	**327.8**	**13,586**	**18,176**	**22,996**	**4,820**	**26.52%**
Engineers	340.6	335.0	353.3	340.6	335.0	353.2	340.8	335.1	353.4	1,378	1384	1633	249	17.99%
Architects and surveyors	335.5	325.0	339.9	335.9	325.4	340.2	336.1	325.1	340.1	191	212	232	20	9.43%
Life scientists	368.5	364.0	359.5	368.5	364.0	359.5	368.5	364.0	359.5	155	180	220	40	22.22%
Computer, mathematical, and operations research occupations	347.0	345.4	348.9	347.6	345.6	349.3	347.5	345.8	349.3	-	1,030	2,038	1,008	97.86%
Physical scientists	315.1	311.7	319.7	314.7	311.3	319.1	314.5	311.1	318.7	192	207	242	35	16.91%
Social scientists	335.2	328.6	335.1	335.3	328.7	335.3	335.2	328.6	335.2	-	264	288	24	9.09%
Social, recreational, and religious workers	322.6	315.0	320.6	322.5	314.8	320.2	322.8	315.1	320.5	-	1,469	1,939	470	31.99%
Lawyers and judicial workers	347.0	340.5	347.5	347.0	340.5	347.5	347.0	340.5	347.5	-	700	820	120	17.14%
Teachers, librarians, and counselors	330.7	321.8	323.8	330.4	321.5	323.8	330.1	321.2	323.5	4,949	6,566	7,914	1,348	20.53%
Health diagnosing occupations	349.0	341.0	348.0	349.0	341.0	348.0	349.0	341.0	348.0	-	876	1037	161	18.38%
Health assessment and treating occupations	321.8	315.1	308.3	321.6	314.7	307.9	321.5	314.6	307.7	1,819	2,684	3,392	708	26.38%
Writers, artists, and entertainers	326.8	321.5	327.3	326.2	320.9	326.4	326.2	320.8	326.3	-	1,724	2,137	413	23.96%
All other professional workers	320.3	312.3	313.3	320.3	312.3	313.3	320.3	312.3	313.3	-	880	1,104	224	25.45%
Technicians and related support occupations	**310.7**	**306.2**	**304.8**	**311.2**	**306.5**	**304.7**	**311.2**	**306.3**	**304.4**	**3,423**	**4,395**	**5,301**	**906**	**20.61%**
Health technicians and technologists	303.4	294.6	290.9	304.9	296.1	292.3	305.4	296.6	292.8	1,598	2,300	2,872	572	24.87%
Engineering and science technicians and technologists	311.5	309.7	311.4	310.9	309.1	310.7	310.8	309.0	310.6	1,037	1,007	1,085	78	7.75%
Technicians, except health and engineering and science	325.2	325.9	324.1	325.5	326.0	324.3	325.3	326.0	324.1	788	1,088	1,344	256	23.53%
Marketing and sales occupations	**294.3**	**289.9**	**295.0**	**293.1**	**288.7**	**293.7**	**293.2**	**288.7**	**293.7**	**11,499**	**14,616**	**16,898**	**2,282**	**15.61%**
Administrative support occupations, including clerical	**293.3**	**288.1**	**290.6**	**294.4**	**289.5**	**291.6**	**294.7**	**289.8**	**291.8**	**20,872**	**24,023**	**25,828**	**1,806**	**7.81%**
Adjusters, investigators, and collectors	306.6	305.5	308.2	304.1	302.4	305.3	303.1	301.1	304.4	735	1,284	1,607	323	25.16%
Communications equipment operators	285.4	278.6	279.0	285.8	278.7	279.3	285.1	278.4	278.8	361	327	296	-31	-9.48%
Computer operators	285.9	286.3	287.7	285.7	286.2	287.6	285.5	286.2	287.4	306	291	198	-93	-31.96%
Information clerks	301.6	297.9	294.7	301.9	298.4	294.4	301.8	298.4	294.0	1,111	1,591	1,958	367	23.07%
Mail clerks and messengers	273.1	271.1	284.1	273.6	271.6	284.6	273.6	271.6	284.6	236	268	291	23	8.58%
Postal clerks and mail carriers	291.0	285.5	291.5	291.0	285.5	291.5	291.0	285.5	291.5	639	403	443	40	9.93%
Material recording, scheduling, dispatching, and distributing	278.6	277.6	279.8	278.6	277.7	279.9	278.9	278.0	280.3	-	3,857	4,084	227	5.89%
Records processing occupations	296.6	291.3	297.4	296.6	291.3	297.2	296.3	291.0	296.7	3,336	3,869	3,888	19	0.49%
Secretaries, stenographers, and typists	295.5	287.0	291.9	298.7	291.0	295.2	299.8	292.1	296.1	-	4,159	4,080	-79	-1.90%
Other clerical and administrative support workers	297.9	291.9	293.2	297.7	291.5	293.0	297.4	291.0	292.7	-	7,974	8,983	1,009	12.65%
Service occupations	**270.0**	**266.1**	**266.2**	**269.7**	**265.7**	**265.8**	**269.5**	**265.3**	**265.6**	**17,427**	**21,317**	**25,144**	**3,827**	**17.95%**
Cleaning and building service occupations, except private household	266.2	261.7	256.9	266.2	261.7	256.9	266.2	261.8	256.9	3,052	3,555	3,713	158	4.44%
Food preparation and service occupations	263.4	261.0	262.0	263.4	261.0	261.9	263.1	260.8	261.8	-	8,406	9,571	1,165	13.86%
Health service occupations	258.0	254.0	250.3	260.1	256.2	252.4	261.8	257.9	254.1	1,542	2,168	2,872	704	32.47%
Personal service occupations	279.4	269.2	272.0	273.7	263.0	265.8	271.1	260.0	263.1	1,524	2,750	3,875	1,125	40.91%
Private household workers	247.5	244.0	237.5	247.5	244.0	237.5	247.5	244.0	237.5	982	802	681	-121	-15.09%
Protective service occupations	297.8	295.0	298.8	296.8	294.3	298.0	295.6	293.2	296.8	-	2,524	2,979	455	18.03%
All other service workers	276.0	272.0	274.5	276.0	272.0	274.5	276.0	272.0	274.5	-	1,112	1,453	341	30.67%
Agriculture, forestry, fishing, and related occupations	**274.4**	**269.9**	**275.2**	**274.6**	**270.4**	**275.7**	**275.1**	**271.0**	**276.3**	**3,660**	**3,788**	**3,823**	**35**	**0.92%**

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant	Prose	Doc	Quant	Prose	Doc	Quant	1986	1996	2006	Number	Percent
Precision production, craft, and repair occupations	**285.9**	**284.5**	**290.5**	**286.0**	**284.5**	**290.4**	**285.8**	**284.3**	**290.2**	**13,831**	**14,461**	**15,448**	**987**	**6.83%**
Blue-A109collar worker supervisors	297.7	299.3	309.1	297.7	299.3	309.1	297.7	299.3	309.1	1,818	1,902	1,947	45	2.37%
Construction trades	277.1	277.4	283.3	277.1	277.3	283.0	276.9	277.2	283.0	3,703	3,713	4,014	301	8.11%
Extractive and related workers, including blasters	244.0	247.0	253.0	244.0	247.0	253.0	244.0	247.0	253.0	245	219	219	0	0.00%
Communications equipment mechanics, installers, and repairers	322.2	310.9	309.5	322.3	311.2	309.2	322.6	311.3	309.2	90	116	120	4	3.45%
Electrical and electronic equipment mechanics, installers, and repairers	306.1	294.2	306.2	306.6	294.6	306.6	307.6	295.2	306.8	-	563	628	65	11.56%
Machinery and related mechanics, installers, and repairers	291.1	287.7	289.7	291.1	287.8	290.0	291.1	287.8	290.1	-	1,901	2,173	272	14.31%
Vehicle and mobile equipment mechanics and repairers	275.7	276.1	283.2	275.3	275.8	283.0	275.2	275.6	283.0	1,469	1,640	1,814	174	10.61%
Other mechanics, installers, and repairers	288.1	285.9	288.8	287.0	284.9	288.0	286.3	284.2	287.4	-	1,089	1,206	147	13.58%
Assemblers, precision	271.4	271.0	281.2	271.2	270.8	281.2	271.0	270.6	281.1	348	380	382	2	0.53%
Food workers, precision	278.1	279.4	282.7	278.1	279.4	282.7	278.0	278.9	282.4	-	299	301	2	0.67%
Inspectors, testers, and graders, precision	NA	NA	NA	NA	NA	NA	NA	NA	NA	694	636	610	-26	-4.09%
Metal workers, precision	274.9	270.6	277.6	274.7	270.3	277.2	274.5	270.1	276.9	946	935	922	-13	-1.39%
Printing workers, precision	292.2	290.8	294.5	292.2	290.8	294.5	286.6	284.0	287.9	-	139	125	-14	-10.07%
Textile, apparel, and furnishings workers, precision	292.9	289.7	288.5	293.7	290.6	289.7	294.8	291.6	290.6	-	228	212	-16	-7.02%
Woodworkers, precision	278.9	278.2	282.8	279.9	279.1	283.3	279.4	278.7	283.1	205	229	248	19	8.30%
Other precision workers	290.2	287.3	290.6	290.2	287.3	290.6	290.1	287.1	290.4	-	206	214	8	3.88%
Plant and system occupations	292.7	289.2	298.1	291.4	287.9	296.5	290.6	287.0	295.5	289	329	362	33	10.03%
Operators, fabricators, and laborers	**264.5**	**263.4**	**270.5**	**264.5**	**263.5**	**270.6**	**264.3**	**263.4**	**270.4**	**16,207**	**17,694**	**19,188**	**1,494**	**8.44%**
Machine tool cut and form setters, operators, and tenders	265.4	262.7	267.5	265.1	262.0	267.2	264.8	261.5	266.9	822	723	677	-46	-6.36%
Metal fabricating machine setters, operators, and related workers	260.3	259.4	271.1	260.3	259.4	271.1	260.6	259.7	271.4	-	157	162	5	3.18%
Metal and plastic processing machine setters and operators	266.5	265.1	276.3	267.1	265.6	276.8	267.5	266.1	277.3	389	466	528	62	13.30%
Printing, binding, and related workers	279.0	277.2	281.5	279.0	277.2	281.5	277.4	275.8	280.6	-	383	393	10	2.61%
Textile and related setters, operators, and related workers	256.1	253.4	261.2	256.7	253.0	260.6	256.3	252.7	259.9	-	935	776	-159	-17.01%
Woodworking machine setters, operators, and other related workers	258.5	254.5	268.5	258.5	254.5	268.5	258.5	254.5	268.5	149	129	118	-11	-8.53%
Other machine setters, set-up operators, operators, and tenders	268.5	266.8	273.6	268.4	266.7	273.4	267.9	266.2	272.8	-	1,919	2,068	149	7.76%
Hand workers, including assemblers and fabricators	267.4	266.9	271.7	266.1	265.6	270.0	264.9	264.5	268.6	2,339	2,813	2,899	86	3.06%
Motor vehicle operators	269.1	269.4	278.1	269.1	269.3	278.0	269.0	269.3	278.0	3,080	3,771	4,345	574	15.22%
Rail transportation workers	279.3	280.8	294.3	276.1	278.9	294.0	277.8	281.6	296.0	117	82	79	-3	-3.66%
Water transportation and related workers	255.0	254.0	261.0	255.0	254.0	261.0	255.0	254.0	261.0	-	52	48	-4	-7.69%
Material moving equipment operators	273.3	271.0	279.1	273.3	271.0	278.8	273.1	270.9	278.8	1,173	1,099	1,211	112	10.19%
All other transportation and material moving equipment operators	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	151	173	22	14.57%
Helpers, laborers, and material movers, hand	257.5	256.8	262.5	257.4	256.7	262.4	257.1	256.4	262.2	4,558	4,976	5,654	678	13.63%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Executive, administrative, and managerial occupations	**324.4**	**316.8**	**326.6**	**324.4**	**316.6**	**326.7**	**324.4**	**316.6**	**326.7**	**10,569**	**13,545**	**15,866**	**2,321**	**17.14%**
Managerial and administrative occupations	**324.0**	**315.0**	**327.3**	**324.2**	**315.1**	**327.5**	**324.3**	**315.2**	**327.5**	**7,374**	**9,541**	**11,262**	**1,721**	**18.04%**
Administrative services managers	318.0	311.0	316.5	318.0	311.0	316.5	318.0	311.0	316.5	214	291	324	33	11.34%
Communication, transportation, and utilities operations managers	313.4	307.1	320.1	313.4	307.1	320.1	313.4	307.1	320.1	-	156	179	23	14.74%
Construction managers	303.0	299.0	311.0	303.0	299.0	311.0	303.0	299.0	311.0	-	249	294	45	18.07%
Education administrators	330.0	312.5	327.0	330.0	312.5	327.0	330.0	312.5	327.0	283	386	430	44	11.40%
Engineering, science, and computer systems managers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	343	498	155	45.19%
Financial managers	342.0	331.0	343.0	342.0	331.0	343.0	342.0	331.0	343.0	634	802	946	144	17.96%
Food service and lodging managers	315.8	309.5	318.0	315.8	309.5	318.0	315.8	309.5	318.0	485	589	757	168	28.52%
Funeral directors and morticians	NA	NA	NA	NA	NA	NA	NA	NA	NA	29	33	33	0	0.00%
General managers and top executives	324.7	314.2	330.4	324.7	314.2	330.4	324.7	314.2	330.4	2,383	3,210	3,677	467	14.55%
Government chief executives and legislators	344.0	334.0	347.0	344.0	334.0	347.0	344.0	334.0	347.0	66	93	95	2	2.15%
Industrial production managers	293.5	292.8	308.0	293.5	292.8	308.0	293.5	292.8	308.0	-	207	202	-5	-2.42%
Marketing, advertising, and public relations managers	331.3	322.5	334.5	331.3	322.5	334.5	331.3	322.5	334.5	323	482	620	138	28.63%
Personnel, training, and labor relations managers	324.7	313.0	320.0	324.7	313.0	320.0	324.7	313.0	320.0	151	216	254	38	17.59%
Property and real estate managers	321.0	314.5	320.5	321.0	314.5	320.5	321.0	314.5	320.5	128	271	315	44	16.24%
Purchasing managers	320.0	313.0	321.0	320.0	313.0	321.0	320.0	313.0	321.0	230	232	251	19	8.19%
All other managers and administrators	323.4	315.9	325.7	323.4	315.9	325.7	323.4	315.9	325.7	-	1,981	2,387	406	20.49%
Management support occupations	**325.2**	**320.5**	**325.0**	**324.7**	**319.9**	**324.9**	**324.6**	**319.7**	**324.8**	**3,195**	**4,004**	**4,604**	**600**	**14.99%**
Accountants and auditors	343.4	341.6	341.4	343.4	341.6	341.4	343.4	341.6	341.4	945	1,002	1,127	125	12.48%
Budget analysts	326.0	319.0	327.0	326.0	319.0	327.0	326.0	319.0	327.0	61	65	73	8	12.31%
Claims examiners, property and casualty insurance	315.0	309.0	319.0	315.0	309.0	319.0	315.0	309.0	319.0	34	57	69	12	21.05%
Construction and building inspectors	303.5	302.0	313.5	303.5	302.0	313.5	303.5	302.0	313.5	50	66	76	10	15.15%
Cost estimators	323.0	318.0	326.0	323.0	318.0	326.0	323.0	318.0	326.0	155	188	217	29	15.43%
Credit analysts	320.7	314.0	319.0	320.7	314.0	319.0	320.7	314.0	319.0	-	40	46	6	15.00%
Employment interviewers, private or public employment service	304.0	295.0	297.0	304.0	295.0	297.0	304.0	295.0	297.0	72	87	101	14	16.09%
Inspectors and compliance officers, except construction	319.5	314.8	326.6	319.5	314.8	326.6	319.5	314.8	326.6	127	163	172	9	5.52%
Loan officers and counselors	319.0	312.0	320.0	319.0	312.0	320.0	319.0	312.0	320.0	98	209	268	59	28.23%
Management analysts	327.7	323.7	336.0	327.7	323.7	336.0	327.7	323.7	336.0	125	244	296	52	21.31%
Personnel, training, and labor relations specialists	330.5	323.5	336.3	330.5	323.5	336.3	330.5	323.5	336.3	227	329	387	58	17.63%
Purchasing agents, except wholesale, retail, and farm products	319.3	315.0	327.0	319.3	315.0	327.0	319.3	315.0	327.0	186	224	238	14	6.25%
Tax examiners, collectors, and revenue agents	312.0	302.0	310.0	312.0	302.0	310.0	312.0	302.0	310.0	57	64	66	2	3.13%
Underwriters	318.0	315.0	304.0	318.0	315.0	304.0	318.0	315.0	304.0	99	95	100	5	5.26%
Wholesale and retail buyers, except farm products	317.0	312.0	319.0	317.0	312.0	319.0	317.0	312.0	319.0	192	183	183	0	0.00%
All other management support workers	313.5	307.0	309.5	313.5	307.0	309.5	313.5	307.0	309.5	-	988	1,185	197	19.94%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Professional specialty occupations	**331.7**	**324.5**	**328.2**	**331.1**	**323.9**	**327.2**	**331.6**	**324.6**	**327.8**	**13,586**	**18,176**	**22,996**	**4,820**	**26.52%**
Engineers	**340.6**	**335.0**	**353.3**	**340.6**	**335.0**	**353.2**	**340.8**	**335.1**	**353.4**	**1,378**	**1384**	**1633**	**249**	**17.99%**
Aeronautical and astronautical engineers	NA	NA	NA	NA	NA	NA	NA	NA	NA	53	53	57	4	7.55%
Chemical engineers	NA	NA	NA	NA	NA	NA	NA	NA	NA	52	49	57	8	16.33%
Civil engineers, including traffic engineers	334.0	321.0	355.0	334.0	321.0	355.0	334.0	321.0	355.0	199	196	231	35	17.86%
Electrical and electronics engineers	345.3	340.3	357.7	345.3	340.3	357.7	345.3	340.3	357.7	406	368	472	104	28.26%
Industrial engineers, except safety engineers	324.0	321.0	337.0	324.0	321.0	337.0	324.0	321.0	337.0	117	115	131	16	13.91%
Mechanical engineers	344.0	340.0	353.0	344.0	340.0	353.0	344.0	340.0	353.0	234	228	264	36	15.79%
Metallurgists and metallurgical, ceramic, and materials engineers	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	18	20	2	11.11%
Mining engineers, including mine safety engineers	337.0	333.0	347.0	337.0	333.0	347.0	337.0	333.0	347.0	5	3	3	0	0.00%
Nuclear engineers	337.0	331.0	351.0	337.0	331.0	351.0	337.0	331.0	351.0	-	14	14	0	0.00%
Petroleum engineers	NA	NA	NA	NA	NA	NA	NA	NA	NA	21	14	11	-3	-21.43%
All other engineers	343.0	339.0	353.0	343.0	339.0	353.0	343.0	339.0	353.0	-	326	373	47	14.42%
Architects and surveyors	**335.5**	**325.0**	**339.9**	**335.9**	**325.4**	**340.2**	**336.1**	**325.1**	**340.1**	**191**	**212**	**232**	**20**	**9.43%**
Architects, except landscape and marine	333.0	315.0	334.0	333.0	315.0	334.0	333.0	315.0	334.0	84	94	113	19	20.21%
Landscape architects	366.0	365.0	370.0	366.0	365.0	370.0	366.0	365.0	370.0	13	17	20	3	17.65%
Surveyors	333.5	328.5	341.0	333.5	328.5	341.0	333.5	328..	341.0	94	101	99	-2	-1.98%
Life scientists	**368.5**	**364.0**	**359.5**	**368.5**	**364.0**	**359.5**	**368.5**	**364.0**	**359.5**	**155**	**180**	**220**	**40**	**22.22%**
Agricultural and food scientists	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	24	29	5	20.83%
Biological scientists	368.5	364.0	359.5	368.5	364.0	359.5	368.5	364.0	359.5	58	83	103	20	24.10%
Foresters and conservation scientists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	37	43	6	16.22%
Medical scientists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	35	44	9	25.71%
All other life scientists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	1	1	0	0.00%
Computer, mathematical, and operations research occupations	**347.0**	**345.4**	**348.9**	**347.6**	**345.6**	**349.3**	**347.5**	**345.8**	**349.3**	**-**	**1,030**	**2,038**	**1,008**	**97.86%**
Actuaries	336.0	329.0	339.0	336.0	329.0	339.0	336.0	329.0	339.0	-	16	16	0	0.00%
Statisticians	326.0	320.0	327.0	326.0	320.0	327.0	326.0	320.0	327.0	-	14	14	0	0.00%
Mathematicians and all other mathematical scientists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	16	17		
Computer engineers	333.0	327.0	338.0	333.0	327.0	338.0	333.0	327.0	338.0	-	216	451	235	108.80%
Database admin. support specialists, and computer scientists	351.0	362.0	354.0	351.0	362.0	354.0	351.0	362.0	354.0	-	212	461	249	117.45%
Systems analysts	352.0	347.0	352.0	352.0	347.0	352.0	352.0	347.0	352.0	331	506	1,025	519	102.57%
Operations research analysts	361.0	355.0	360.0	361.0	355.0	360.0	361.0	355.0	360.0	-	50	54	4	8.00%
Physical scientists	**318.1**	**311.7**	**319.7**	**314.7**	**311.3**	**319.1**	**314.5**	**311.1**	**318.7**	**192**	**207**	**242**	**35**	**16.91%**
Chemists	319.0	316.0	327.0	319.0	316.0	327.0	319.0	316.0	327.0	86	91	108	17	18.68%
Geologists, geophysicists, and oceanographers	NA	NA	NA	NA	NA	NA	NA	NA	NA	43	48	54	6	12.50%
Meteorologists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	7	8	1	14.29%
Physicists and astronomers	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	18	17	-1	-5.56%
All other physical scientists	305.7	301.3	302.3	305.7	301.3	302.3	305.7	301.3	302.3	-	43	55	12	27.91%
Social scientists	**335.2**	**328.6**	**336.1**	**336.3**	**328.7**	**336.3**	**335.2**	**328.6**	**336.2**	**-**	**264**	**288**	**24**	**9.09%**
Economists	330.0	324.0	331.5	330.0	324.0	331.5	330.0	324.0	331.5	37	51	60	9	17.65%
Psychologists	334.8	328.3	335.3	334.8	328.3	335.3	334.8	328.3	335.3	112	143	154	11	7.69%
Urban and regional planners	348.0	340.0	348.0	348.0	340.0	348.0	348.0	340.0	348.0	20	29	31	2	6.90%
All other social scientists	335.0	328.3	331.3	335.0	328.3	331.3	335.0	328.3	331.3	-	41	43	2	4.88%
Social, recreational, and religious workers	**322.6**	**315.0**	**320.6**	**322.5**	**314.8**	**320.2**	**322.8**	**315.1**	**320.5**	**-**	**1,469**	**1,939**	**470**	**31.99%**
Clergy	NA	NA	NA	NA	NA	NA	NA	NA	NA	295	208	236	28	13.46%
Directors, religious activities and education	345.0	335.0	339.0	345.0	335.0	339.0	345.0	335.0	339.0	46	85	115	30	35.29%
Human services workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	178	276	98	55.06%
Recreation workers	314.0	307.0	311.0	314.0	307.0	311.0	314.0	307.0	311.0	163	233	285	52	22.32%
Residential counselors	334.0	325.0	337.0	334.0	325.0	337.0	334.0	325.0	337.0	-	180	254	74	41.11%
Social workers	319.0	311.9	315.9	319.0	311.9	315.9	319.0	311.9	315.9	369	585	772	187	31.97%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Professional specialty occupations, Continued	**331.7**	**324.5**	**328.2**	**330.4**	**326.1**	**327.5**	**331.6**	**324.6**	**327.8**	**13,586**	**18,176**	**22,996**	**4,820**	**26.52%**
Lawyers and judicial workers	**347.0**	**340.5**	**347.5**	**347.0**	**340.5**	**347.5**	**347.0**	**340.5**	**347.5**	**-**	**700**	**820**	**120**	**17.14%**
Judges, magistrates, and other judicial workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	38	78	79	1	1.28%
Lawyers	347.0	340.5	347.5	347.0	340.5	347.5	347.0	340.5	347.5	527	622	740	118	18.97%
Teachers, librarians, and counselors	**330.7**	**321.8**	**323.8**	**330.4**	**321.5**	**323.6**	**330.1**	**321.3**	**323.5**	**4,949**	**6,566**	**7,914**	**1,348**	**20.53%**
Teachers, preschool and kindergarten	322.5	312.5	312.5	322.5	312.5	312.5	322.5	312.5	312.5	-	499	596	97	19.44%
Teachers, elementary	332.0	323.0	329.0	332.0	323.0	329.0	332.0	323.0	329.0	-	1,491	1,644	153	10.26%
Teachers, secondary school	334.0	327.0	333.0	334.0	327.0	333.0	334.0	327.0	333.0	1,128	1,406	1,718	312	22.19%
Teachers, special education	325.0	316.0	324.0	325.0	316.0	324.0	325.0	316.0	324.0	261	407	648	241	59.21%
College and university faculty	NA	NA	NA	NA	NA	NA	NA	NA	NA	754	864	1,026	162	18.75%
Farm and home management advisors	330.0	321.0	322.0	330.0	321.0	322.0	330.0	321.0	322.0	-	16	10	-6	-37.50%
Instructors and coaches, sports and physical training	316.0	309.0	296.0	316.0	309.0	296.0	316.0	309.0	296.0	-	303	427	124	40.92%
Instructors, adult (nonvocational) education	336.0	329.0	337.0	336.0	329.0	337.0	336.0	329.0	337.0	202	248	299	51	20.56%
Teachers and instructors, vocational education and training	319.0	308.0	313.0	319.0	308.0	313.0	319.0	308.0	313.0	225	311	383	72	23.15%
All other teachers and instructors	339.0	330.0	316.0	339.0	330.0	316.0	339.0	330.0	316.0	-	671	770	99	14.75%
Curators, archivists, museum technicians, and restorers	315.0	313.0	307.0	315.0	313.0	307.0	315.0	313.0	307.0	8	20	23	3	15.00%
Librarians, professional	341.5	323.5	330.5	341.5	323.5	330.5	341.5	323.5	330.5	136	154	162	8	5.19%
Counselors	320.0	306.0	311.0	320.0	306.0	311.0	320.0	306.0	311.0	122	176	209	33	18.75%
Health diagnosing occupations	**349.0**	**341.0**	**348.0**	**349.0**	**341.0**	**348.0**	**349.0**	**341.0**	**348.0**	**-**	**876**	**1037**	**161**	**18.38%**
Chiropractors	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	44	55	11	25.00%
Dentists	NA	NA	NA	NA	NA	NA	NA	NA	NA	151	162	175	13	8.02%
Optometrists	NA	NA	NA	NA	NA	NA	NA	NA	NA	37	41	46	5	12.20%
Physicians	349.0	341.0	348.0	349.0	341.0	348.0	349.0	341.0	348.0	491	560	678	118	21.07%
Podiatrists	NA	NA	NA	NA	NA	NA	NA	NA	NA	13	11	12	1	9.09%
Veterinarians and veterinary inspectors	NA	NA	NA	NA	NA	NA	NA	NA	NA	36	58	71	13	22.41%
Health assessment and treating occupations	**321.8**	**318.1**	**308.3**	**321.6**	**314.7**	**307.9**	**321.5**	**314.6**	**307.7**	**1,819**	**2,684**	**3,392**	**708**	**26.38%**
Dietitians and nutritionists	338.0	321.0	311.0	338.0	321.0	311.0	338.0	321.0	311.0	40	58	69	11	18.97%
Pharmacists	334.0	337.0	334.0	334.0	337.0	334.0	334.0	337.0	334.0	150	172	194	22	12.79%
Physician assistants	NA	NA	NA	NA	NA	NA	NA	NA	NA	26	64	93	29	45.31%
Registered nurses	320.3	313.0	306.0	320.3	313.0	306.0	320.3	313.0	306.0	1,406	1,971	2,382	411	20.85%
Occupational therapists	320.0	314.0	315.0	320.0	314.0	315.0	320.0	314.0	315.0	29	57	95	38	66.67%
Physical therapists	NA	NA	NA	NA	NA	NA	NA	NA	NA	58	115	196	81	70.43%
Recreational therapists	NA	NA	NA	NA	NA	NA	NA	NA	NA	29	38	46	8	21.05%
Respiratory therapists	315.0	306.0	292.0	315.0	306.0	292.0	315.0	306.0	292.0	56	82	119	37	45.12%
Speech-language pathologists and audiologists	NA	NA	NA	NA	NA	NA	NA	NA	NA	45	87	131	44	50.57%
All other therapists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	40	67	27	67.50%
Writers, artists, and entertainers	**326.8**	**321.5**	**327.3**	**326.2**	**320.9**	**326.4**	**326.2**	**320.8**	**326.3**	**-**	**1,724**	**2,137**	**413**	**23.96%**
Artists and commercial artists	316.5	312.5	315.0	316.5	312.5	315.0	316.5	312.5	315.0	183	276	354	78	28.26%
Athletes, coaches, umpires, and related workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	42	49	7	16.67%
Dancers and choreographers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	23	30	7	30.43%
Designers, except interior designers	332.3	327.7	337.7	332.3	327.7	337.7	332.3	327.7	337.7	-	279	351	72	25.81%
Interior designers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	63	80	17	26.98%
Musicians	NA	NA	NA	NA	NA	NA	NA	NA	NA	189	274	366	92	33.58%
Camera operators, television, motion picture, video	300.0	298.0	296.0	300.0	298.0	296.0	300.0	298.0	296.0	10	20	23	3	15.00%
Photographers	320.0	318.0	318.0	320.0	318.0	318.0	320.0	318.0	318.0	98	134	157	23	17.16%
Producers, directors, actors, and entertainers	318.0	311.0	309.0	318.0	311.0	309.0	318.0	311.0	309.0	73	108	130	25	23.81%
Public relations specialists and publicity writers	330.0	321.0	324.0	330.0	321.0	324.0	330.0	321.0	324.0	87	110	140	30	27.27%
Radio and TV announcers and newscasters	NA	NA	NA	NA	NA	NA	NA	NA	NA	61	82	82	0	0.00%
Reporters and correspondents	NA	NA	NA	NA	NA	NA	NA	NA	NA	62	60	58	-2	-3.33%
Writers and editors, including technical writers	335.8	328.8	339.6	335.8	326.8	339.6	335.8	328.8	339.6	214	286	347	61	21.33%
All other professional workers	**320.3**	**312.3**	**313.3**	**320.3**	**312.3**	**313.3**	**320.3**	**312.3**	**313.3**	**-**	**880**	**1,104**	**224**	**25.45%**

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Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Technicians and related support occupations	**310.7**	**306.2**	**304.8**	**311.2**	**306.5**	**304.7**	**311.2**	**306.3**	**304.4**	**3,423**	**4,395**	**5,301**	**906**	**20.61%**
Health technicians and technologists	**303.4**	**294.6**	**290.9**	**304.9**	**296.1**	**292.3**	**305.4**	**296.6**	**292.8**	**1,598**	**2,300**	**2,872**	**572**	**24.87%**
Cardiology technologists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	17	23	6	35.29%
Clinical laboratory technologists and technicians	318.0	313.0	300.0	318.0	313.0	300.0	318.0	313.0	300.0	244	284	328	44	15.49%
Dental hygienists	325.0	309.0	313.0	325.0	309.0	313.0	325.0	309.0	313.0	87	133	197	64	48.12%
Electroneurodiagnostic technologists	322.0	314.0	291.0	322.0	314.0	291.0	322.0	314.0	291.0	6	6	8	2	33.33%
EKG technicians	293.0	281.0	273.0	293.0	281.0	273.0	293.0	281.0	273.0	18	15	11	-4	-26.67%
Emergency medical technicians	333.0	326.0	308.0	333.0	326.0	308.0	333.0	326.0	308.0	56	150	217	67	44.67%
Licensed practical nurses	297.0	286.0	286.0	297.0	286.0	286.0	297.0	286.0	286.0	631	699	848	149	21.32%
Medical records technicians	300.0	295.0	297.0	300.0	295.0	297.0	300.0	295.0	297.0	40	87	132	45	51.72%
Nuclear medicine technologists	NA	NA	NA	NA	NA	NA	NA	NA	NA	10	13	15	2	15.38%
Opticians, dispensing and measuring	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	67	76	9	13.43%
Pharmacy technicians	312.0	308.0	308.0	312.0	308.0	308.0	312.0	308.0	308.0	-	83	92	9	10.84%
Psychiatric technicians	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	66	72	6	9.09%
Radiologic technologists and technicians	314.0	303.0	310.0	314.0	303.0	310.0	314.0	303.0	310.0	115	174	224	50	28.74%
Surgical technologists	285.0	280.0	275.0	285.0	280.0	275.0	285.0	280.0	275.0	37	49	64	15	30.61%
Veterinary technicians and technologists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	27	34	7	25.93%
All other health professionals and paraprofessionals	291.3	284.3	277.3	291.3	284.3	277.3	291.3	284.3	277.3	-	430	531	101	23.49%
Engineering and science technicians and technologists	**311.5**	**309.7**	**311.4**	**310.9**	**309.1**	**310.7**	**310.8**	**309.0**	**310.6**	**1,037**	**1,007**	**1,085**	**78**	**7.75%**
Electrical and electronic technicians and technologists	314.0	310.0	311.7	314.0	310.0	311.7	314.0	310.0	311.7	313	297	341	44	14.81%
All other engineering technicians and technologists	296.7	298.0	297.0	296.7	298.0	297.0	296.7	298.0	297.0	376	400	427	27	6.75%
Drafters	322.3	322.0	324.2	322.3	322.0	324.2	322.3	322.0	324.2	348	310	317	7	2.26%
Science and mathematics technicians	316.0	310.0	315.0	316.0	310.0	315.0	316.0	310.0	315.0	235	229	258	29	12.66%
Technicians, except health and engineering and science	**325.2**	**325.9**	**324.1**	**325.5**	**326.0**	**324.3**	**325.3**	**326.0**	**324.1**	**788**	**1,088**	**1,344**	**256**	**23.53%**
Aircraft pilots and flight engineers	344.6	339.6	346.2	344.6	339.6	346.2	344.6	339.6	346.2	75	111	125	14	12.61%
Air traffic controllers and airplane dispatchers	341.0	333.0	342.0	341.0	333.0	342.0	341.0	333.0	342.0	26	29	29	0	0.00%
Broadcast technicians	313.0	307.0	306.0	313.0	307.0	306.0	313.0	307.0	306.0	27	46	53	7	15.22%
Computer programmers	327.5	332.0	326.5	327.5	332.0	326.5	327.5	332.0	326.5	474	572	697	125	21.85%
Paralegals	NA	NA	NA	NA	NA	NA	NA	NA	NA	57	113	189	76	67.26%
Title examiners and searchers	304.0	300.0	311.0	304.0	300.0	311.0	304.0	300.0	311.0	30	26	29	3	11.54%
All other legal assistants, including law clerks	313.0	307.0	307.0	313.0	307.0	307.0	313.0	307.0	307.0	79	82	92	10	12.20%
Programmers, numerical, tool, and process control	328.0	324.0	333.0	328.0	324.0	333.0	328.0	324.0	333.0	9	7	7	0	0.00%
Technical assistants, library	305.0	300.0	303.0	305.0	300.0	303.0	305.0	300.0	303.0	51	78	100	22	28.21%
All other technicians	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	24	23	-1	-4.17%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Marketing and sales occupations	**294.3**	**289.9**	**295.0**	**293.1**	**288.7**	**293.7**	**293.3**	**288.7**	**293.7**	**11,499**	**14,616**	**16,898**	**2,282**	**15.61%**
Cashiers	281.0	277.0	278.0	281.0	277.0	278.0	281.0	277.0	278.0	2,171	3,147	3,677	530	16.84%
Counter and rental clerks	245.0	239.0	247.0	245.0	239.0	247.0	245.0	239.0	247.0	178	374	458	84	22.46%
Insurance sales workers	316.0	311.0	316.0	316.0	311.0	316.0	316.0	311.0	316.0	463	409	426	17	4.16%
Marketing and sales worker supervisors	295.7	289.0	298.1	295.7	289.0	298.1	295.7	289.0	298.1	–	2,316	2,562	246	10.62%
Brokers, real estate	323.0	314.0	322.0	323.0	314.0	322.0	323.0	314.0	322.0	80	78	89	11	14.10%
Real estate appraisers	335.0	330.0	336.0	335.0	330.0	336.0	335.0	330.0	336.0	37	48	54	6	12.50%
Sales agents, real estate	NA	NA	NA	NA	NA	NA	NA	NA	NA	295	282	298	16	5.67%
Salespersons, retail	292.4	290.8	294.8	292.4	290.8	294.8	292.4	290.8	294.8	3,583	4,054	4,481	427	10.53%
Securities and financial services sales workers	328.0	316.5	329.0	328.0	316.5	329.0	328.0	316.5	329.0	197	263	363	100	38.02%
Travel agents	320.0	312.0	321.0	320.0	312.0	321.0	320.0	312.0	321.0	105	142	176	34	23.94%
All other sales and related workers	300.5	295.0	301.0	300.5	295.0	301.0	300.5	295.0	301.0	–	3,503	4,314	811	23.15%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Administrative support occupations, including clerical	**293.3**	**288.1**	**290.6**	**294.4**	**289.5**	**291.6**	**294.7**	**289.8**	**291.8**	**20,872**	**24,023**	**25,828**	**1,805**	**7.51%**
Adjusters, investigators, and collectors	**306.6**	**305.5**	**308.2**	**304.1**	**302.4**	**305.3**	**303.1**	**301.1**	**304.4**	**735**	**1,284**	**1,607**	**323**	**25.16%**
Adjustment clerks	295.0	294.0	293.0	295.0	294.0	293.0	295.0	294.0	293.0	136	401	584	183	45.64%
Bill and account collectors	299.0	294.0	304.0	299.0	294.0	304.0	299.0	294.0	304.0	126	269	381	112	41.64%
Insurance adjusters, examiners, and investigators	326.0	321.0	333.0	326.0	321.0	333.0	326.0	321.0	333.0	118	166	203	36	23.03%
Insurance claims clerks	306.0	299.0	304.0	306.0	299.0	304.0	306.0	299.0	304.0	84	122	153	31	25.41%
Insurance policy processing clerks	308.0	319.0	313.0	308.0	319.0	313.0	308.0	319.0	313.0	149	180	171	-9	-5.00%
Welfare eligibility workers and interviewers	308.0	302.0	300.0	308.0	302.0	300.0	308.0	302.0	300.0	86	109	76	-33	-30.28%
All other adjusters and investigators	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	38	39	1	2.63%
Communications equipment operators	**285.4**	**278.6**	**279.0**	**285.8**	**278.7**	**279.3**	**285.1**	**278.4**	**278.8**	**361**	**327**	**296**	**-31**	**-9.48%**
Central office operators	293.0	280.0	285.0	293.0	280.0	285.0	293.0	280.0	285.0	42	48	26	-22	-45.83%
Directory assistance operators	288.0	282.0	280.0	288.0	282.0	280.0	288.0	282.0	280.0	32	33	18	-15	-45.45%
Switchboard operators	264.0	278.0	278.0	264.0	278.0	278.0	264.0	278.0	278.0	279	237	246	9	3.80%
All other communications equipment operators	NA	NA	NA	NA	NA	NA	NA	NA	NA	12	9	6	-3	-33.33%
Computer operators	**285.9**	**286.3**	**287.7**	**285.7**	**286.2**	**287.6**	**285.5**	**286.2**	**287.4**	**306**	**291**	**198**	**-93**	**-31.96%**
Computer operators, except peripheral equipment	285.0	286.0	287.0	285.0	286.0	287.0	285.0	286.0	287.0	263	258	181	-77	-29.84%
Peripheral computer equipment operators	291.0	288.0	292.0	291.0	288.0	292.0	291.0	288.0	292.0	46	33	17	-16	-48.48%
Information clerks	**301.6**	**297.9**	**294.7**	**301.9**	**298.4**	**294.4**	**301.8**	**298.4**	**294.0**	**1,111**	**1,891**	**1,958**	**367**	**23.07%**
Hotel desk clerks	NA	NA	NA	NA	NA	NA	NA	NA	NA	108	143	174	31	21.68%
Interviewing clerks, except personnel and social welfare	294.0	289.0	293.0	294.0	289.0	293.0	294.0	289.0	293.0	104	98	115	17	17.35%
New accounts clerks, banking	297.0	292.0	299.0	297.0	292.0	299.0	297.0	292.0	299.0	94	110	115	5	4.55%
Receptionists and information clerks	302.0	299.0	292.0	302.0	299.0	292.0	302.0	299.0	292.0	682	1,074	1,392	318	29.61%
Reservation and transportation ticket agents and travel clerks	309.0	304.0	308.0	309.0	304.0	308.0	309.0	304.0	308.0	122	166	162	-4	-2.41%
Mail clerks and messengers	**273.1**	**271.1**	**284.1**	**273.6**	**271.6**	**284.6**	**273.6**	**271.6**	**284.6**	**236**	**268**	**291**	**23**	**8.58%**
Mail clerks, except mail machine operators and postal service	271.0	269.0	282.0	271.0	269.0	282.0	271.0	269.0	282.0	136	130	137	7	5.38%
Messengers	276.0	274.0	287.0	276.0	274.0	287.0	276.0	274.0	287.0	99	138	154	16	11.59%
Postal clerks and mail carriers	**291.0**	**285.5**	**291.5**	**291.0**	**285.5**	**291.5**	**291.0**	**285.5**	**291.5**	**639**	**403**	**443**	**40**	**9.93%**
Postal mail carriers	NA	NA	NA	NA	NA	NA	NA	NA	NA	269	332	369	37	11.14%
Postal service clerks	291.0	285.5	291.5	291.0	285.5	291.5	291.0	285.5	291.5	370	71	74	3	4.23%
Material recording, scheduling, dispatching, and distributing	**278.6**	**277.6**	**279.8**	**278.6**	**277.7**	**279.9**	**278.9**	**278.0**	**280.3**	**-**	**3,887**	**4,084**	**227**	**5.89%**
Dispatchers, except police, fire, and ambulance	296.0	293.0	297.5	296.0	293.0	297.5	296.0	293.0	297.5	123	148	165	17	11.49%
Dispatchers, police, fire, and ambulance	310.5	305.5	310.5	310.5	305.5	310.5	310.5	305.5	310.5	61	86	93	7	8.14%
Meter readers, utilities	278.0	276.0	283.0	278.0	276.0	283.0	278.0	276.0	283.0	-	55	56	1	1.82%
Order fillers, wholesale and retail sales	NA	NA	NA	NA	NA	NA	NA	NA	NA	195	227	255	28	12.33%
Procurement clerks	296.0	291.0	295.0	296.0	291.0	295.0	296.0	291.0	295.0	-	56	55	-1	-1.79%
Production, planning, and expediting clerks	302.0	294.0	293.0	302.0	294.0	293.0	302.0	294.0	293.0	210	239	254	15	6.28%
Stock clerks	268.5	266.0	264.5	268.5	266.0	264.5	268.5	266.0	264.5	-	1,844	1,898	54	2.93%
Traffic, shipping, and receiving clerks	282.0	287.0	295.0	282.0	287.0	295.0	282.0	287.0	295.0	-	985	1,070	85	8.63%
Weighers, measurers, checkers, and samplers, recordkeeping	275.0	273.0	285.0	275.0	273.0	285.0	275.0	273.0	285.0	-	47	50	3	6.38%
All other material recording, scheduling, and distribution workers	300.0	297.0	302.0	300.0	297.0	302.0	300.0	297.0	302.0	-	170	188	18	10.59%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1986 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Administrative support occupations, including clerical (Continued)	**293.3**	**288.1**	**290.6**	**297.8**	**291.4**	**295.2**	**294.7**	**289.8**	**291.8**	**20,872**	**24,030**	**25,825**	**1,795**	**7.47%**
Records processing occupations	**296.6**	**291.3**	**297.4**	**296.6**	**291.3**	**297.2**	**296.3**	**291.0**	**296.7**	**3,336**	**3,869**	**3,888**	**19**	**0.49%**
Advertising clerks	300.0	296.0	301.0	300.0	296.0	301.0	300.0	296.0	301.0	~	18	18	0	0.00%
Brokerage clerks	292.0	287.0	287.0	292.0	287.0	287.0	292.0	287.0	287.0	59	76	91	15	19.74%
Correspondence clerks	299.0	293.0	295.0	299.0	293.0	295.0	299.0	293.0	295.0	25	31	41	10	32.26%
File clerks	307.0	303.0	303.0	307.0	303.0	303.0	307.0	303.0	303.0	239	293	315	22	7.51%
Billing, cost, and rate clerks	284.0	275.0	277.0	284.0	275.0	277.0	284.0	275.0	277.0	306	335	391	56	16.72%
Billing, posting, and calculating machine operators	278.7	276.7	283.0	278.7	276.7	283.0	278.7	276.7	283.0	104	102	100	-2	-1.96%
Bookkeeping, accounting, and auditing clerks	300.2	295.0	303.0	300.2	295.0	303.0	300.2	295.0	303.0	2,113	2,251	2,147	-104	-4.62%
Payroll and timekeeping clerks	292.0	287.0	296.0	292.0	287.0	296.0	292.0	287.0	296.0	~	161	151	-10	-6.21%
Library assistants and bookmobile drivers	297.0	287.0	289.0	297.0	287.0	289.0	297.0	287.0	289.0	102	125	145	20	16.00%
Order clerks, materials, merchandise, and service	283.0	280.0	285.0	283.0	280.0	285.0	283.0	280.0	285.0	270	328	338	10	3.06%
Personnel clerks, except payroll and timekeeping	301.0	295.0	296.0	301.0	295.0	296.0	301.0	295.0	296.0	119	124	126	2	1.61%
Statement clerks	285.0	282.0	286.0	285.0	282.0	286.0	285.0	282.0	286.0	~	25	25	0	0.00%
Secretaries, stenographers, and typists	**295.5**	**287.0**	**291.9**	**298.7**	**291.0**	**295.2**	**299.8**	**292.1**	**296.1**	**~**	**4,159**	**4,080**	**-79**	**-1.90%**
Legal secretaries	316.0	304.0	306.0	316.0	304.0	306.0	316.0	304.0	306.0	238	283	319	36	12.72%
Medical secretaries	306.0	295.0	299.0	306.0	295.0	299.0	306.0	295.0	299.0	180	239	314	75	31.38%
Secretaries, except legal and medical	305.0	300.0	303.0	305.0	300.0	303.0	305.0	300.0	303.0	2,814	2,886	2,794	-92	-3.19%
Stenographers and/or court reporters	292.0	284.5	280.0	292.0	284.5	280.0	292.0	284.5	280.0	~	98	101	3	3.06%
Typists, including word processing	262.0	245.0	257.0	262.0	245.0	257.0	262.0	245.0	257.0	996	653	552	-101	-15.47%
Other clerical and administrative support workers	**297.9**	**291.9**	**293.2**	**297.7**	**291.5**	**293.0**	**297.4**	**291.0**	**292.7**	**~**	**7,974**	**8,983**	**1,009**	**12.66%**
Bank tellers	301.0	297.0	299.0	301.0	297.0	299.0	301.0	297.0	299.0	~	545	550	5	0.92%
Clerical supervisors and managers	302.2	297.7	301.3	302.2	297.7	301.3	302.2	297.7	301.3	960	1,370	1,630	260	18.98%
Court clerks	298.0	291.0	292.0	298.0	291.0	292.0	298.0	291.0	292.0	40	53	57	4	7.55%
Credit authorizers	300.0	294.0	294.0	300.0	294.0	294.0	300.0	294.0	294.0	18	16	10	-6	-37.50%
Credit checkers	307.0	306.0	308.0	307.0	306.0	308.0	307.0	306.0	308.0	~	42	33	-9	-21.43%
Loan and credit clerks	311.0	304.0	307.0	311.0	304.0	307.0	311.0	304.0	307.0	~	181	200	19	10.50%
Loan interviewers	305.0	298.0	313.0	305.0	298.0	313.0	305.0	298.0	313.0	~	12	13	1	8.33%
Customer service representatives, utilities	294.0	289.0	294.0	294.0	289.0	294.0	294.0	289.0	294.0	102	152	206	54	35.53%
Data entry keyers, except composing	304.0	295.0	295.0	304.0	295.0	295.0	304.0	295.0	295.0	~	418	453	35	8.37%
Data entry keyers, composing	294.0	293.0	291.0	294.0	293.0	291.0	294.0	293.0	291.0	~	18	10	-8	-44.44%
Duplicating, mail, and other office machine operators	278.0	276.0	273.0	278.0	276.0	273.0	278.0	276.0	273.0	~	196	149	-47	-23.98%
General office clerks	299.0	295.0	294.7	299.0	295.0	294.7	299.0	295.0	294.7	2,358	3,113	3,326	213	6.84%
Municipal clerks	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	22	24	2	9.09%
Proofreaders and copy markers	293.0	289.0	292.0	293.0	289.0	292.0	293.0	289.0	292.0	28	26	16	-10	-38.46%
Real estate clerks	304.0	300.0	301.0	304.0	300.0	301.0	304.0	300.0	301.0	26	24	25	1	4.17%
Statistical clerks	289.0	284.5	286.0	289.0	284.5	286.0	289.0	284.5	286.0	~	78	65	-13	-16.67%
Teacher aides and educational assistants	284.0	271.0	276.0	284.0	271.0	276.0	284.0	271.0	276.0	633	981	1,352	371	37.82%
All other clerical and administrative support workers	299.0	288.0	288.5	299.0	288.0	288.5	299.0	288.0	288.5	~	727	864	137	18.84%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Service occupations	**270.0**	**266.1**	**266.2**	**269.7**	**265.7**	**265.8**	**269.5**	**265.3**	**265.6**	**17,427**	**21,317**	**25,144**	**3,827**	**17.95%**
Cleaning and building service occupations, except private household	**266.2**	**261.7**	**256.9**	**266.2**	**261.7**	**256.9**	**266.2**	**261.8**	**256.9**	**3,052**	**3,585**	**3,713**	**158**	**4.44%**
Institutional cleaning supervisors	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	108	115	7	6.48%
Janitors and cleaners, including maids and housekeeping cleaners	266.0	261.5	256.5	266.0	261.5	256.5	266.0	261.5	256.5	2,622	3,144	3,262	118	3.75%
Pest controllers and assistants	277.0	274.0	277.0	277.0	274.0	277.0	277.0	274.0	277.0	47	60	73	13	21.67%
All other cleaning and building service workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	243	263	20	8.23%
Food preparation and service occupations	**263.4**	**261.0**	**262.0**	**263.4**	**261.0**	**261.9**	**263.1**	**260.8**	**261.8**	**-**	**8,406**	**9,571**	**1,165**	**13.86%**
Bakers, bread and pastry	NA	NA	NA	NA	NA	NA	NA	NA	NA	124	183	231	48	26.23%
Cooks, institution or cafeteria	243.0	240.0	232.0	243.0	240.0	232.0	243.0	240.0	232.0	384	435	455	20	4.60%
Cooks, restaurant	271.0	267.0	261.0	271.0	267.0	261.0	271.0	267.0	261.0	514	728	833	105	14.42%
Cooks, short order and fast food	258.0	262.0	276.0	258.0	262.0	276.0	258.0	262.0	276.0	-	804	978	174	21.64%
Food preparation workers	258.7	257.0	255.0	258.7	257.0	255.0	258.7	257.0	255.0	948	1,255	1,487	232	18.49%
Bartenders	285.0	287.0	288.0	285.0	287.0	288.0	285.0	287.0	288.0	396	390	392	2	0.51%
Dining room and cafeteria attendants and bar helpers	246.0	240.0	235.0	246.0	240.0	235.0	246.0	240.0	235.0	433	439	501	62	14.12%
Food counter, fountain, and related workers	251.0	249.0	257.0	251.0	249.0	257.0	251.0	249.0	257.0	1,505	1,723	1,963	240	13.93%
Hosts and hostesses, restaurant, lounge, or coffee shop	277.0	274.0	278.0	277.0	274.0	278.0	277.0	274.0	278.0	-	260	278	18	6.92%
Waiters and waitresses	279.0	274.0	270.5	279.0	274.0	270.5	279.0	274.0	270.5	1,705	1,961	2,163	202	10.30%
All other food preparation and service workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	228	290	62	27.19%
Health service occupations	**258.0**	**254.0**	**250.3**	**260.1**	**256.2**	**252.4**	**261.8**	**257.9**	**254.1**	**1,542**	**2,168**	**2,873**	**704**	**32.47%**
Ambulance drivers and attendants, except EMTs	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	18	25	7	38.89%
Dental assistants	276.0	268.0	263.0	276.0	268.0	263.0	276.0	268.0	263.0	155	202	278	76	37.62%
Medical assistants	290.0	286.0	281.0	290.0	286.0	281.0	290.0	286.0	281.0	131	225	391	166	73.78%
Nursing aides, orderlies, and attendants	251.5	248.0	244.0	251.5	248.0	244.0	251.5	248.0	244.0	1,211	1,312	1,645	333	25.38%
Psychiatric aides	257.0	250.0	254.0	257.0	250.0	254.0	257.0	250.0	254.0	-	103	112	9	8.74%
Occupational therapy assistants and aides	338.0	333.0	339.0	338.0	333.0	339.0	338.0	333.0	339.0	9	16	26	10	62.50%
Pharmacy assistants	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	47	52	5	10.64%
Physical and corrective therapy assistants and aides	266.0	268.0	264.0	266.0	268.0	264.0	266.0	268.0	264.0	36	85	151	66	77.65%
All other health service workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	160	192	32	20.00%
Personal service occupations	**279.4**	**269.2**	**272.0**	**273.7**	**263.0**	**265.8**	**271.1**	**260.0**	**263.1**	**1,824**	**2,750**	**3,875**	**1,125**	**40.91%**
Amusement and recreation attendants	289.0	275.0	286.0	289.0	275.0	286.0	289.0	275.0	286.0	-	288	426	138	47.92%
Baggage porters and bellhops	253.0	252.0	256.0	253.0	252.0	256.0	253.0	252.0	256.0	31	38	40	2	5.26%
Barbers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	59	54	-5	-8.47%
Child care workers	264.0	250.0	255.0	264.0	250.0	255.0	264.0	250.0	255.0	583	830	1,129	299	36.02%
Hairdressers, hairstylists, and cosmetologists	296.0	291.0	289.0	296.0	291.0	289.0	296.0	291.0	289.0	563	584	644	60	10.27%
Manicurists	NA	NA	NA	NA	NA	NA	NA	NA	NA	25	43	62	19	44.19%
Shampooers	NA	NA	NA	NA	NA	NA	NA	NA	NA	12	13	13	0	0.00%
Flight attendants	321.0	315.0	311.0	321.0	315.0	311.0	321.0	315.0	311.0	79	130	178	48	36.92%
Home health aides	244.0	232.0	234.0	244.0	232.0	234.0	244.0	232.0	234.0	143	498	873	375	75.30%
Personal and home care aides	NA	NA	NA	NA	NA	NA	NA	NA	NA	59	202	374	172	85.15%
Ushers, lobby attendants, and ticket takers	NA	NA	NA	NA	NA	NA	NA	NA	NA	40	65	82	17	26.15%
Private household workers	**247.5**	**244.0**	**237.5**	**247.5**	**244.0**	**237.5**	**247.5**	**244.0**	**237.5**	**982**	**802**	**681**	**-121**	**-15.09%**
Child care workers, private household	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	275	250	-25	-9.09%
Cleaners and servants, private household	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	505	421	-84	-16.63%
Cooks, private household	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	8	3	-5	-62.50%
Housekeepers and butlers	247.5	244.0	237.5	247.5	244.0	237.5	247.5	244.0	237.5	-	14	7	-7	-50.00%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Service occupations, Continued	**270.0**	**266.1**	**266.2**	**269.7**	**265.7**	**265.8**	**269.5**	**265.3**	**265.6**	**17,427**	**21,317**	**25,144**	**3,827**	**17.95%**
Protective service occupations	**297.8**	**295.0**	**298.6**	**296.8**	**294.3**	**298.0**	**296.6**	**293.2**	**296.8**	**-**	**2,524**	**2,979**	**455**	**18.03%**
Fire fighters	311.0	314.0	320.0	311.0	314.0	320.0	311.0	314.0	320.0	223	225	238	13	5.78%
Fire fighting and prevention supervisors	335.0	329.0	338.0	335.0	329.0	338.0	335.0	329.0	338.0	45	54	54	0	0.00%
Fire inspection occupations	315.5	310.0	315.0	315.5	310.0	315.0	315.5	310.0	315.0	11	14	16	2	14.29%
Correction officers	283.0	287.0	291.0	283.0	287.0	291.0	283.0	287.0	291.0	176	320	423	103	32.19%
Police and detective supervisors	326.0	317.0	326.0	326.0	317.0	326.0	326.0	317.0	326.0	84	90	89	-1	-1.11%
Police detectives and investigators	337.5	330.5	328.5	337.5	330.5	328.5	337.5	330.5	328.5	57	70	75	5	7.14%
Police patrol officers	330.5	328.5	330.0	330.5	328.5	330.0	330.5	328.5	330.0	349	413	486	73	17.68%
Sheriffs and deputy sheriffs	305.0	308.0	307.0	305.0	308.0	307.0	305.0	308.0	307.0	63	88	96	8	9.09%
Other law enforcement occupations	NA	NA	NA	NA	NA	NA	NA	NA	NA	32	43	47	4	9.30%
Detectives and investigators, except public	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	58	69	11	18.97%
Guards	274.0	269.0	273.0	274.0	269.0	273.0	274.0	269.0	273.0	-	955	1,175	220	23.04%
Crossing guards	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	61	55	-6	-9.84%
All other protective service workers	301.3	295.0	299.0	301.3	295.0	299.0	301.3	295.0	299.0	-	133	156	23	17.29%
All other service workers	**276.0**	**272.0**	**274.5**	**276.0**	**272.0**	**274.5**	**276.0**	**272.0**	**274.5**	**-**	**1,112**	**1,453**	**341**	**30.67%**

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Agriculture, forestry, fishing, and related occupations	**274.4**	**269.9**	**275.2**	**274.6**	**270.4**	**275.7**	**275.1**	**271.0**	**276.3**	**3,660**	**3,788**	**3,823**	**35**	**0.92%**
Animal caretakers, except farm	271.0	268.0	270.0	271.0	268.0	270.0	271.0	268.0	270.0	81	130	158	28	21.54%
Farmers	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,181	1,109	997	-112	-10.10%
Farm managers	NA	NA	NA	NA	NA	NA	NA	NA	NA	149	184	178	-6	-3.26%
Farm workers	268.5	262.5	267.0	268.5	262.5	267.0	268.5	262.5	267.0	-	873	798	-75	-8.59%
Captains and other officers, fishing vessels	312.0	308.0	321.0	312.0	308.0	321.0	312.0	308.0	321.0	-	8	7	-1	-12.50%
Fishers, hunters, and trappers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	39	30	-9	-23.08%
Forest and conservation workers	307.0	305.0	314.0	307.0	305.0	314.0	307.0	305.0	314.0	36	40	41	1	2.50%
Fallers and buckers	NA	NA	NA	NA	NA	NA	NA	NA	NA	36	17	16	-1	-5.88%
Logging tractor operators	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	22	22	0	0.00%
Log handling equipment operators	267.0	264.0	267.0	267.0	264.0	267.0	267.0	264.0	267.0	15	33	34	1	3.03%
All other timber cutting and related logging workers	277.0	276.5	291.5	277.0	276.5	291.5	277.0	276.5	291.5	-	11	10	-1	-9.09%
Gardeners, nursery workers and laborers, and landscaping	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	817	975	158	19.34%
Lawn service managers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	55	67	12	21.82%
Nursery and greenhouse managers	314.0	308.0	322.0	314.0	308.0	322.0	314.0	308.0	322.0	-	10	12	2	20.00%
Pruners	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	26	30	4	15.38%
Sprayers/applicators	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	18	21	3	16.67%
Supervisors, farming, forestry, and agricutural related occupations	293.7	289.3	296.0	293.7	289.3	296.0	293.7	289.3	296.0	-	88	92	4	4.55%
Veterinary assistants	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	33	42	9	27.27%
All other agricultural, forestry, fishing, and related workers	283.3	283.5	291.3	283.3	283.5	291.3	283.3	283.5	291.3	175	275	293	18	6.55%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Precision production, craft, and repair occupations	**285.9**	**284.5**	**290.5**	**286.0**	**284.5**	**290.4**	**285.8**	**284.3**	**290.2**	**13,831**	**14,461**	**15,448**	**987**	**6.83%**
Blue collar worker supervisors	**297.7**	**299.3**	**309.1**	**297.7**	**299.3**	**309.1**	**297.7**	**299.3**	**309.1**	**1,818**	**1,902**	**1,947**	**45**	**2.37%**
Construction trades	**277.1**	**277.4**	**283.3**	**277.1**	**277.3**	**283.0**	**276.9**	**277.2**	**283.0**	**3,703**	**3,713**	**4,014**	**301**	**8.11%**
Bricklayers and stone masons	263.0	267.0	271.0	263.0	267.0	271.0	263.0	267.0	271.0	156	143	162	19	13.29%
Carpenters	281.5	280.5	287.0	281.5	280.5	287.0	281.5	280.5	287.0	1,009	982	1,038	56	5.70%
Carpet installers	NA	NA	NA	NA	NA	NA	NA	NA	NA	66	64	72	8	12.50%
Ceiling tile installers and acoustical carpenters	NA	NA	NA	NA	NA	NA	NA	NA	NA	19	16	18	2	12.50%
Concrete and terrazzo finishers	272.0	268.0	265.0	272.0	268.0	265.0	272.0	268.0	265.0	113	137	147	10	7.30%
Drywall installers and finishers	NA	NA	NA	NA	NA	NA	NA	NA	NA	149	133	140	7	5.26%
Electricians	287.0	293.0	304.0	287.0	293.0	304.0	287.0	293.0	304.0	552	575	627	52	9.04%
Glaziers	NA	NA	NA	NA	NA	NA	NA	NA	NA	46	36	38	2	5.56%
Hard tile setters	NA	NA	NA	NA	NA	NA	NA	NA	NA	25	29	30	1	3.45%
Highway maintenance workers	279.0	274.0	272.0	279.0	274.0	272.0	279.0	274.0	272.0	-	171	158	-13	-7.60%
Insulation workers	265.0	264.0	269.0	265.0	264.0	269.0	265.0	264.0	269.0	60	65	78	13	20.00%
Painters and paperhangers, construction and maintenance	265.0	265.0	271.0	265.0	265.0	271.0	265.0	265.0	271.0	410	444	509	65	14.64%
Paving, surfacing, and tamping equipment operators	NA	NA	NA	NA	NA	NA	NA	NA	NA	57	79	103	24	30.38%
Pipelayers and pipelaying fitters	NA	NA	NA	NA	NA	NA	NA	NA	NA	55	63	66	3	4.76%
Plasterers	275.0	273.0	277.0	275.0	273.0	277.0	275.0	273.0	277.0	27	32	36	4	12.50%
Plumbers, pipefitters, and steamfitters	276.0	274.7	280.0	276.0	274.7	280.0	276.0	274.7	280.0	398	389	406	17	4.37%
Roofers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	138	144	6	4.35%
Structural and reinforcing metal workers	262.0	260.0	269.0	262.0	260.0	269.0	262.0	260.0	269.0	84	67	73	6	8.96%
All other construction trades workers	267.7	267.0	266.0	267.7	267.0	266.0	267.7	267.0	266.0	-	150	169	19	12.67%
Extractive and related workers, including blasters	**244.0**	**247.0**	**253.0**	**244.0**	**247.0**	**253.0**	**244.0**	**247.0**	**253.0**	**245**	**219**	**219**	**0**	**0.00%**
Roustabouts	NA	NA	NA	NA	NA	NA	NA	NA	NA	55	28	18	-10	-35.71%
All other oil and gas extraction occupations	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	37	34	-3	-8.11%
Mining, quarrying, and tunneling occupations	NA	NA	NA	NA	NA	NA	NA	NA	NA	21	16	12	-4	-25.00%
All other extraction and related workers	244.0	247.0	253.0	244.0	247.0	253.0	244.0	247.0	253.0	-	138	155	17	12.32%
Communications equipment mechanics, installers, and repairers	**322.2**	**310.9**	**309.5**	**322.3**	**311.2**	**309.2**	**322.6**	**311.3**	**309.2**	**90**	**116**	**120**	**4**	**3.45%**
Central office and PBX installers and repairers	321.0	308.0	313.0	321.0	308.0	313.0	321.0	308.0	313.0	77	81	85	4	4.94%
Radio mechanics	300.0	300.0	308.0	300.0	300.0	308.0	300.0	300.0	308.0	-	8	7	-1	-12.50%
All other communications equipment mechanics, installers, and repairers	333.0	324.0	298.0	333.0	324.0	298.0	333.0	324.0	298.0	-	27	28	1	3.70%
Electrical and electronic equipment mechanics, installers, and repairers	**306.1**	**294.2**	**306.2**	**306.6**	**294.6**	**306.6**	**307.6**	**295.2**	**306.8**	**-**	**563**	**628**	**65**	**11.55%**
Data processing equipment repairers	316.0	312.0	314.0	316.0	312.0	314.0	316.0	312.0	314.0	-	80	121	41	51.25%
Electrical powerline installers and repairers	294.0	286.0	297.0	294.0	286.0	297.0	294.0	286.0	297.0	107	108	111	3	2.78%
Electronic home entertainment equipment repairers	283.0	282.0	291.0	283.0	282.0	291.0	283.0	282.0	291.0	-	33	27	-6	-18.18%
Electronics repairers, commercial and industrial equipment	NA	NA	NA	NA	NA	NA	NA	NA	NA	79	60	67	7	11.67%
Station installers and repairers, telephone	315.0	307.0	320.0	315.0	307.0	320.0	315.0	307.0	320.0	-	37	10	-27	-72.97%
Telephone and cable TV line installers and repairers	312.0	292.0	309.0	312.0	292.0	309.0	312.0	292.0	309.0	-	201	242	41	20.40%
All other electrical and electronic equipment mechanics	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	44	50	6	13.64%
							.0	.0	.0					
Machinery and related mechanics, installers, and repairers	**291.1**	**287.7**	**289.7**	**291.1**	**287.8**	**290.0**	**291.1**	**287.8**	**290.1**	**-**	**1,901**	**2,173**	**272**	**14.31%**
Industrial machinery mechanics	289.0	285.0	282.0	289.0	285.0	282.0	289.0	285.0	282.0	420	459	489	30	6.54%
Maintenance repairers, general utility	291.0	288.0	292.0	291.0	288.0	292.0	291.0	288.0	292.0	1,014	1,364	1,608	244	17.89%
Millwrights	305.5	301.5	303.0	305.5	301.5	303.0	305.5	301.5	303.0	-	78	76	-2	-2.56%
Vehicle and mobile equipment mechanics and repairers	**275.7**	**276.1**	**283.2**	**275.3**	**275.8**	**283.0**	**275.2**	**275.6**	**283.0**	**1,469**	**1,640**	**1,814**	**174**	**10.61%**
Aircraft engine specialists	274.0	284.0	296.0	274.0	284.0	296.0	274.0	284.0	296.0	-	25	27	2	8.00%
Aircraft mechanics	254.0	255.0	269.0	254.0	255.0	269.0	254.0	255.0	269.0	89	111	128	17	15.32%
Automotive body and related repairers	263.0	261.0	268.0	263.0	261.0	268.0	263.0	261.0	268.0	214	225	254	29	12.89%
Automotive mechanics	280.0	282.0	292.0	280.0	282.0	292.0	280.0	282.0	292.0	750	774	871	97	12.53%
Bus and truck mechanics and diesel engine specialists	272.0	273.0	276.0	272.0	273.0	276.0	272.0	273.0	276.0	263	266	288	22	8.27%
Farm equipment mechanics	291.0	286.0	286.0	291.0	286.0	286.0	291.0	286.0	286.0	52	44	37	-7	-15.91%
Mobile heavy equipment mechanics	286.0	281.0	282.0	286.0	281.0	282.0	286.0	281.0	282.0	100	104	111	7	6.73%
Motorcycle, boat, and small engine mechanics	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	45	49	4	8.89%
Motorcycle repairers	304.0	297.0	280.0	304.0	297.0	280.0	304.0	297.0	280.0	-	12	13	1	8.33%
Small engine specialists	285.0	278.0	268.0	285.0	278.0	268.0	285.0	278.0	268.0	-	34	36	2	5.88%

Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Precision production, craft, and repair occupations (Continued)	**285.9**	**284.5**	**290.5**	**272.5**	**273.3**	**281.5**	**285.5**	**284.3**	**290.2**	**13,831**	**14,461**	**15,448**	**987**	**6.83%**
Other mechanics, installers, and repairers	**288.1**	**285.9**	**288.5**	**287.0**	**284.9**	**288.0**	**286.3**	**284.2**	**287.4**	**~**	**1,059**	**1,206**	**147**	**13.88%**
Bicycle repairers	NA	NA	NA	NA	NA	NA	NA	NA	NA	27	13	17	4	30.77%
Camera and photographic equipment repairers	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	14	18	4	28.57%
Coin and vending machine servicers and repairers	308.0	303.0	296.0	308.0	303.0	296.0	308.0	303.0	296.0	~	21	19	-2	-9.52%
Electric meter installers and repairers	303.0	298.0	299.0	303.0	298.0	299.0	303.0	298.0	299.0	~	12	8	-4	-33.33%
Electromedical and biomedical equipment repairers	330.0	325.0	320.0	330.0	325.0	320.0	330.0	325.0	320.0	7	10	11	1	10.00%
Elevator installers and repairers	300.0	298.0	296.0	300.0	298.0	296.0	300.0	298.0	296.0	~	25	27	2	8.00%
Heat, air conditioning, and refrigeration mechanics and installers	302.0	301.0	307.5	302.0	301.0	307.5	302.0	301.0	307.5	220	256	300	44	17.19%
Home appliance and power tool repairers	320.0	316.0	309.0	320.0	316.0	309.0	320.0	316.0	309.0	75	70	73	3	4.29%
Locksmiths and safe repairers	295.0	290.0	289.0	295.0	290.0	289.0	295.0	290.0	289.0	~	25	29	4	16.00%
Musical instrument repairers and tuners	NA	NA	NA	NA	NA	NA	NA	NA	NA	9	9	10	1	11.11%
Office machine and cash register servicers	285.0	281.0	283.0	285.0	281.0	283.0	285.0	281.0	283.0	~	62	73	11	17.74%
Precision instrument repairers	305.0	301.0	305.0	305.0	301.0	305.0	305.0	301.0	305.0	49	38	38	0	0.00%
Riggers	NA	NA	NA	NA	NA	NA	NA	NA	NA	19	9	8	-1	-11.11%
Tire repairers and changers	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	94	101	7	7.45%
Watchmakers	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	7	7	0	0.00%
All other mechanics, installers, and repairers	266.0	264.5	268.5	266.0	264.5	268.5	266.0	264.5	268.5	~	394	467	73	18.53%
Assemblers, precision	**271.4**	**271.0**	**281.2**	**271.2**	**270.8**	**281.2**	**271.0**	**270.6**	**281.1**	**348**	**380**	**382**	**2**	**0.53%**
Aircraft assemblers, precision	279.0	278.0	284.0	279.0	278.0	284.0	279.0	278.0	284.0	23	25	27	2	8.00%
Electrical and electronic equipment assemblers, precision	261.0	262.0	279.0	261.0	262.0	279.0	261.0	262.0	279.0	~	194	193	-1	-0.52%
Electromechanical equipment assemblers, precision	301.0	298.0	298.5	301.0	298.0	298.5	301.0	298.0	298.5	~	51	51	0	0.00%
Fitters, structural metal, precision	291.0	288.0	278.0	291.0	288.0	278.0	291.0	288.0	278.0	~	15	12	-3	-20.00%
Machine builders and other precision machine assemblers	289.0	286.0	285.0	289.0	286.0	285.0	289.0	286.0	285.0	50	57	58	1	1.75%
All other precision assemblers	244.0	245.0	263.0	244.0	245.0	263.0	244.0	245.0	263.0	~	38	41	3	7.89%
Food workers, precision	**278.1**	**279.4**	**282.7**	**278.1**	**279.4**	**282.7**	**278.8**	**278.9**	**282.4**	**~**	**299**	**301**	**2**	**0.67%**
Bakers, manufacturing	280.0	284.0	285.0	280.0	284.0	285.0	280.0	284.0	285.0	~	44	47	3	6.82%
Butchers and meatcutters	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	217	205	-12	-5.53%
All other precision food and tobacco workers	276.0	274.0	280.0	276.0	274.0	280.0	276.0	274.0	280.0	~	38	49	11	28.95%
Inspectors, testers, and graders, precision	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**694**	**636**	**610**	**-26**	**-4.09%**
Metal workers, precision	**274.9**	**270.6**	**277.6**	**274.7**	**270.3**	**277.2**	**274.5**	**270.1**	**276.9**	**946**	**935**	**922**	**-13**	**-1.39%**
Boilermakers	291.0	288.0	293.0	291.0	288.0	293.0	291.0	288.0	293.0	~	18	18	0	0.00%
Jewelers and silversmiths	NA	NA	NA	NA	NA	NA	NA	NA	NA	31	32	31	-1	-3.13%
Machinists	264.0	258.0	265.0	264.0	258.0	265.0	264.0	258.0	265.0	383	387	384	-3	-0.78%
Sheet metal workers and duct installers	281.0	278.0	284.0	281.0	278.0	284.0	281.0	278.0	284.0	~	237	236	-1	-0.42%
Shipfitters	NA	NA	NA	NA	NA	NA	NA	NA	NA	13	10	9	-1	-10.00%
Tool and die makers	292.0	290.0	298.0	292.0	290.0	298.0	292.0	290.0	298.0	161	134	124	-10	-7.46%
All other precision metal workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	117	120	3	2.56%
	.0	.0	.0											
Printing workers, precision	**292.2**	**290.8**	**294.5**	**292.2**	**290.8**	**294.5**	**285.6**	**284.0**	**287.9**	**~**	**139**	**125**	**-14**	**-10.07%**
Bookbinders	284.0	282.0	284.0	284.0	282.0	284.0	284.0	282.0	284.0	~	4	4	0	0.00%
Compositors and typesetters, precision	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	6	3	-3	-50.00%
Job printers	280.0	277.0	280.0	280.0	277.0	280.0	280.0	277.0	280.0	~	15	15	0	0.00%
Paste-up workers	327.0	326.0	331.0	327.0	326.0	331.0	327.0	326.0	331.0	~	15	4	-11	-73.33%
Desktop publishing specialists	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	30	53	23	76.67%
Photoengravers	311.0	310.0	303.0	311.0	310.0	303.0	311.0	310.0	303.0	~	5	3	-2	-40.00%
Camera operators	302.0	301.0	304.0	302.0	301.0	304.0	302.0	301.0	304.0	~	11	10	-1	-9.09%
Film strippers, printing	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	26	7	-19	-73.08%
Platemakers	274.0	273.0	278.0	274.0	273.0	278.0	274.0	273.0	278.0	~	14	12	-2	-14.29%
All other printing workers, precision	273.0	272.0	279.0	273.0	272.0	279.0	273.0	272.0	279.0	~	13	14	1	7.69%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Precision production, craft, and repair occupations (Continued)	**285.9**	**284.5**	**290.5**	**288.8**	**286.5**	**288.5**	**285.8**	**284.3**	**290.2**	**13,831**	**14,461**	**15,448**	**987**	**6.83%**
Textile, apparel, and furnishings workers, precision	**292.9**	**289.7**	**288.5**	**293.7**	**290.6**	**289.7**	**294.8**	**291.6**	**290.6**	**-**	**228**	**212**	**-16**	**-7.02%**
Custom tailors and sewers	280.0	278.0	279.0	280.0	278.0	279.0	280.0	278.0	279.0	-	87	73	-14	-16.09%
Patternmakers and layout workers, fabric and apparel	300.0	297.5	297.5	300.0	297.5	297.5	300.0	297.5	297.5	-	14	14	0	0.00%
Shoe and leather workers and repairers, precision	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	21	17	-4	-19.05%
Upholsterers	268.0	264.0	261.0	268.0	264.0	261.0	268.0	264.0	261.0	75	56	57	1	1.79%
All other precision textile, apparel, and furnishings workers	322.0	318.0	316.0	322.0	318.0	316.0	322.0	318.0	316.0	-	50	51	1	2.00%
Woodworkers, precision	**278.9**	**278.2**	**282.8**	**279.9**	**279.1**	**283.3**	**279.4**	**278.7**	**283.1**	**205**	**229**	**248**	**19**	**8.30%**
Cabinetmakers and bench carpenters	291.0	289.0	288.0	291.0	289.0	288.0	291.0	289.0	288.0	110	121	128	7	5.79%
Furniture finishers	280.0	280.0	289.0	280.0	280.0	289.0	280.0	280.0	289.0	29	30	33	3	10.00%
Wood machinists	250.0	252.0	267.0	250.0	252.0	267.0	250.0	252.0	267.0	47	45	51	6	13.33%
All other precision woodworkers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	33	36	3	9.09%
Other precision workers	**290.2**	**287.3**	**290.6**	**290.2**	**287.3**	**290.6**	**290.1**	**287.1**	**290.4**	**-**	**206**	**214**	**8**	**3.88%**
Dental laboratory technicians, precision	315.0	309.0	312.0	315.0	309.0	312.0	315.0	309.0	312.0	-	47	48	1	2.13%
Optical goods workers, precision	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	19	19	0	0.00%
Photographic process workers, precision	276.5	275.0	287.0	276.5	275.0	287.0	276.5	275.0	287.0	-	14	14	0	0.00%
All other precision workers	282.5	280.5	283.0	282.5	280.5	283.0	282.5	280.5	283.0	-	126	133	7	5.56%
Plant and system occupations	**292.7**	**289.2**	**298.1**	**291.4**	**287.9**	**296.5**	**290.6**	**287.0**	**295.5**	**289**	**329**	**362**	**33**	**10.03%**
Chemical plant and system operators	288.0	285.0	298.0	288.0	285.0	298.0	288.0	285.0	298.0	33	37	36	-1	-2.70%
Power distributors and dispatchers	327.0	323.0	339.0	327.0	323.0	339.0	327.0	323.0	339.0	20	15	15	0	0.00%
Power generating and reactor plant operators	293.0	289.0	291.0	293.0	289.0	291.0	293.0	289.0	291.0	25	31	34	3	9.68%
Gas and petroleum plant and system occupations	318.0	313.5	317.5	318.0	313.5	317.5	318.0	313.5	317.5	31	33	29	-4	-12.12%
Stationary engineers	293.0	289.0	298.0	293.0	289.0	298.0	293.0	289.0	298.0	-	27	26	-1	-3.70%
Water and liquid waste treatment plant and system operators	289.5	284.0	289.5	289.5	284.0	289.5	289.5	284.0	289.5	74	98	121	23	23.47%
All other plant and system operators	278.0	277.0	290.0	278.0	277.0	290.0	278.0	277.0	290.0	-	88	101	13	14.77%

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Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Operators, fabrication, and laborers	**264.5**	**263.4**	**270.5**	**264.5**	**263.5**	**270.6**	**264.3**	**263.4**	**270.4**	**16,207**	**17,694**	**19,188**	**1,494**	**8.44%**
Numerical control machine tool operators and tenders	285.0	284.0	288.0	285.0	284.0	288.0	285.0	284.0	288.0	57	92	117	25	27.17%
Combination machine tool setters, set-up operators, operators	286.0	283.0	286.0	286.0	283.0	286.0	286.0	283.0	286.0	92	97	113	16	16.49%
Machine tool cut and form setters, operators, and tenders	**265.4**	**262.7**	**267.5**	**265.1**	**263.0**	**267.2**	**264.6**	**261.5**	**266.9**	**822**	**723**	**677**	**-46**	**-6.36%**
Drilling and boring machine tool setters and set-up operators	263.0	262.0	265.0	263.0	262.0	265.0	263.0	262.0	265.0	63	46	36	-10	-21.74%
Grinding machine setters and set-up operators, metal and plastic	272.0	269.0	277.0	272.0	269.0	277.0	272.0	269.0	277.0	~	63	56	-7	-11.11%
Lathe and turning machine tool setters and set-up operators	273.0	273.0	273.0	273.0	273.0	273.0	273.0	273.0	273.0	96	71	61	-10	-14.08%
Machine forming operators and tenders, metal and plastic	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	174	168	-6	-3.45%
Machine tool cutting operators and tenders, metal and plastic	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	127	105	-22	-17.32%
Punching machine setters and set-up operators, metal and plastic	259.0	257.0	265.0	259.0	257.0	265.0	259.0	257.0	265.0	61	51	47	-4	-7.84%
All other machine tool setters, set-up operators, metal and plastic	262.0	257.0	263.0	262.0	257.0	263.0	262.0	257.0	263.0	~	191	204	13	6.81%
Metal fabricating machine setters, operators, and related workers	**260.3**	**259.4**	**271.1**	**260.3**	**259.4**	**271.1**	**260.6**	**259.7**	**271.4**	**~**	**157**	**162**	**5**	**3.18%**
Metal fabricators, structural metal products	273.0	272.0	286.0	273.0	272.0	286.0	273.0	272.0	286.0	~	46	50	4	8.70%
Soldering and brazing machine operators and tenders	246.0	247.0	264.0	246.0	247.0	264.0	246.0	247.0	264.0	~	11	11	0	0.00%
Welding machine setters, operators, and tenders	256.0	255.0	265.0	256.0	255.0	265.0	256.0	255.0	265.0	~	100	101	1	1.00%
Metal and plastic processing machine setters and operators	**266.5**	**265.1**	**276.3**	**267.1**	**265.6**	**276.8**	**267.5**	**266.1**	**277.3**	**389**	**466**	**528**	**62**	**13.30%**
Electrolytic plating machine operators and tenders and setters	255.0	254.0	267.0	255.0	254.0	267.0	255.0	254.0	267.0	46	42	46	4	9.52%
Foundry mold assembly and shakeout workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	10	10	0	0.00%
Furnace operators and tenders	248.0	246.0	267.0	248.0	246.0	267.0	248.0	246.0	267.0	20	21	20	-1	-4.76%
Heat treating machine operators and tenders, metal and plastic	268.0	265.0	266.0	268.0	265.0	266.0	268.0	265.0	266.0	20	21	20	-1	-4.76%
Metal molding machine operators and tenders and setters	248.0	248.0	256.0	248.0	248.0	256.0	248.0	248.0	256.0	35	45	49	4	8.89%
Plastic molding machine operators and tenders, and setters	281.0	279.0	292.0	281.0	279.0	292.0	281.0	279.0	292.0	147	183	216	33	18.03%
All other metal and plastic machine setters and operators	261.5	260.5	270.0	261.5	260.5	270.0	261.5	260.5	270.0	~	144	167	23	15.97%
Printing, binding, and related workers	**279.0**	**277.2**	**281.5**	**279.0**	**277.2**	**281.5**	**277.4**	**275.8**	**280.6**	**~**	**383**	**393**	**10**	**2.61%**
Bindery machine operators and set-up operators	258.0	257.0	265.0	258.0	257.0	265.0	258.0	257.0	265.0	~	81	85	4	4.94%
Photoengraving and lithographic machine operators and tenders	282.0	279.0	277.0	282.0	279.0	277.0	282.0	279.0	277.0	~	6	5	-1	-16.67%
Typesetting and composing machine operators and tenders	320.0	314.0	306.0	320.0	314.0	306.0	320.0	314.0	306.0	~	14	3	-11	-78.57%
Letterpress operators	288.0	287.0	291.0	288.0	287.0	291.0	288.0	287.0	291.0	~	14	9	-5	-35.71%
Offset lithographic press operators	273.0	271.0	281.0	273.0	271.0	281.0	273.0	271.0	281.0	~	76	80	4	5.26%
Printing press machine setters, operators and tenders	291.0	289.0	289.0	291.0	289.0	289.0	291.0	289.0	289.0	~	119	129	10	8.40%
All other printing press setters and set-up operators	279.0	282.0	289.5	279.0	282.0	289.5	279.0	282.0	289.5	~	6	7	1	16.67%
Screen printing machine setters and set-up operators	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	29	31	2	6.90%
All other printing, binding, and related workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	38	44	6	15.79%
Textile and related setters, operators, and related workers	**256.1**	**253.4**	**261.2**	**255.7**	**253.0**	**260.6**	**255.3**	**252.7**	**259.9**	**~**	**935**	**776**	**-159**	**-17.01%**
Extruding and forming machine operators and tenders, fibers	261.0	260.0	272.0	261.0	260.0	272.0	261.0	260.0	272.0	14	22	24	2	9.09%
Pressing machine operators and tenders, textile, garment	256.0	255.0	266.0	256.0	255.0	266.0	256.0	255.0	266.0	87	78	80	2	2.56%
Sewing machine operators, garment	256.5	252.5	260.5	256.5	252.5	260.5	256.5	252.5	260.5	630	454	334	-120	-26.43%
Sewing machine operators, non-garment	242.0	238.0	236.0	242.0	238.0	236.0	242.0	238.0	236.0	~	130	128	-2	-1.54%
Textile bleaching and dyeing machine operators and tenders	265.0	265.0	267.0	265.0	265.0	267.0	265.0	265.0	267.0	22	26	28	2	7.69%
Textile draw-out and winding machine operators and tenders	261.0	261.0	275.0	261.0	261.0	275.0	261.0	261.0	275.0	218	184	155	-29	-15.76%
Textile machine setters and set-up operators	263.0	262.0	273.0	263.0	262.0	273.0	263.0	262.0	273.0	~	41	27	-14	-34.15%
Woodworking machine setters, operators, and other related workers	**258.5**	**254.5**	**268.5**	**258.5**	**254.5**	**268.5**	**258.5**	**254.5**	**268.5**	**149**	**129**	**118**	**-11**	**-8.53%**
Head sawyers and sawing machine operators and tenders, and setters	259.0	251.0	267.0	259.0	251.0	267.0	259.0	251.0	267.0	74	65	59	-6	-9.23%
Woodworking machine operators and tenders, setters and set-up operators	258.0	258.0	270.0	258.0	258.0	270.0	258.0	258.0	270.0	75	64	59	-5	-7.81%

Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Operators, fabricators, and laborers (Continued)	**264.5**	**263.4**	**270.5**	**267.6**	**266.3**	**272.2**	**264.3**	**263.4**	**270.4**	**16,287**	**17,862**	**19,365**	**1,503**	**8.41%**
Other machine setters, set-up operators, operators, and tenders	**268.5**	**266.8**	**273.6**	**268.4**	**266.7**	**273.4**	**267.9**	**266.2**	**272.8**	-	**1,919**	**2,068**	**149**	**7.76%**
Boiler operators and tenders, low pressure	281.0	278.0	290.0	281.0	278.0	290.0	281.0	278.0	290.0	-	17	14	-3	-17.65%
Cement and gluing machine operators and tenders	244.0	244.0	268.0	244.0	244.0	268.0	244.0	244.0	268.0	42	35	30	-5	-14.29%
Chemical equipment controllers, operators and tenders	276.0	274.0	282.0	276.0	274.0	282.0	276.0	274.0	282.0	73	79	82	3	3.80%
Cooking and roasting machine operators and tenders, food and tobacco	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	30	32	2	6.67%
Crushing and mixing machine operators and tenders	277.5	275.5	276.0	277.5	275.5	276.0	277.5	275.5	276.0	131	145	144	-1	-0.69%
Cutting and slicing machine setters, operators and tenders	272.0	269.0	271.0	272.0	269.0	271.0	272.0	269.0	271.0	-	95	103	8	8.42%
Dairy processing equipment operators, including setters	288.0	288.0	289.0	288.0	288.0	289.0	288.0	288.0	289.0	16	13	12	-1	-7.69%
Electronic semiconductor processors	279.0	277.0	280.0	279.0	277.0	280.0	279.0	277.0	280.0	-	58	65	7	12.07%
Extruding and forming machine setters, operators and tenders	281.0	279.0	290.0	281.0	279.0	290.0	281.0	279.0	290.0	102	107	106	-1	-0.93%
Furnace, kiln, or kettle operators and tenders	276.0	273.0	278.0	276.0	273.0	278.0	276.0	273.0	278.0	-	28	25	-3	-10.71%
Laundry and drycleaning machine operators and tenders, except pressing	263.5	263.5	260.5	263.5	263.5	260.5	263.5	263.5	260.5	-	180	219	39	21.67%
Motion picture projectionists	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	8	5	-3	-37.50%
Packaging and filling machine operators and tenders	257.0	256.0	267.0	257.0	256.0	267.0	257.0	256.0	267.0	296	355	410	55	15.49%
Coating, painting, and spraying machine operators, tenders, and setters	275.0	272.0	277.0	275.0	272.0	277.0	275.0	272.0	277.0	-	122	127	5	4.10%
Painters, transportation equipment	228.0	226.0	235.0	228.0	226.0	235.0	228.0	226.0	235.0	-	49	58	9	18.37%
Paper goods machine setters and set-up operators	281.0	282.0	296.0	281.0	282.0	296.0	281.0	282.0	296.0	-	51	44	-7	-13.73%
Photographic processing machine operators and tenders	287.0	286.0	290.0	287.0	286.0	290.0	287.0	286.0	290.0	-	49	53	4	8.16%
Separating and still machine operators and tenders	273.0	273.0	279.0	273.0	273.0	279.0	273.0	273.0	279.0	26	19	17	-2	-10.53%
Shoe sewing machine operators and tenders	NA	NA	NA	NA	NA	NA	NA	NA	NA	27	11	6	-5	-45.45%
Tire building machine operators	NA	NA	NA	NA	NA	NA	NA	NA	NA	13	14	12	-2	-14.29%
All other machine operators, tenders, setters, and set-up operators	269.3	266.7	274.7	269.3	266.7	274.7	269.3	266.7	274.7	-	454	504	50	11.01%
Hand workers, including assemblers and fabricators	**267.4**	**266.9**	**271.7**	**266.1**	**265.6**	**270.0**	**264.9**	**264.5**	**268.6**	**2,339**	**2,813**	**2,899**	**86**	**3.06%**
Cannery workers	256.0	255.0	265.0	256.0	255.0	265.0	256.0	255.0	265.0	-	66	62	-4	-6.06%
Coil winders, tapers, and finishers	268.0	267.0	272.0	268.0	267.0	272.0	268.0	267.0	272.0	34	22	21	-1	-4.55%
Cutters and trimmers, hand	269.0	270.0	290.0	269.0	270.0	290.0	269.0	270.0	290.0	-	46	48	2	4.35%
Electrical and electronic assemblers	285.7	284.0	286.0	285.7	284.0	286.0	285.7	284.0	286.0	-	229	226	-3	-1.31%
Grinders and polishers, hand	260.0	260.0	272.0	260.0	260.0	272.0	260.0	260.0	272.0	-	74	72	-2	-2.70%
Machine assemblers	285.0	284.0	292.0	285.0	284.0	292.0	285.0	284.0	292.0	50	59	57	-2	-3.39%
Meat, poultry, and fish cutters and trimmers, hand	224.0	224.0	218.0	224.0	224.0	218.0	224.0	224.0	218.0	102	152	186	34	22.37%
Painting, coating, and decorating workers, hand	259.3	259.3	270.3	259.3	259.3	270.3	259.3	259.3	270.3	-	31	34	3	9.68%
Pressers, hand	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	14	13	-1	-7.14%
Sewers, hand	273.5	273.5	284.0	273.5	273.5	284.0	273.5	273.5	284.0	21	13	13	0	0.00%
Solderers and brazers	280.0	279.0	284.0	280.0	279.0	284.0	280.0	279.0	284.0	-	26	32	6	23.08%
Welders and cutters	270.3	270.3	274.5	270.3	270.3	274.5	270.3	270.3	274.5	-	352	384	32	9.09%
All other assemblers, fabricators, and hand workers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	1,729	1,751	22	1.27%
Motor vehicle operators	**269.1**	**269.4**	**278.1**	**269.1**	**269.3**	**278.0**	**269.0**	**269.3**	**278.0**	**3,080**	**3,771**	**4,345**	**574**	**15.22%**
Bus drivers, except school	NA	NA	NA	NA	NA	NA	NA	NA	NA	144	166	192	26	15.66%
Bus drivers, school	NA	NA	NA	NA	NA	NA	NA	NA	NA	331	424	518	94	22.17%
Taxi drivers and chauffeurs	280.0	282.0	288.0	280.0	282.0	288.0	280.0	282.0	288.0	88	106	114	8	7.55%
Driver/sales workers	271.0	270.0	286.0	271.0	270.0	286.0	271.0	270.0	286.0	-	331	370	39	11.78%
Truck drivers light and heavy	268.3	268.7	276.7	268.3	268.7	276.7	268.3	268.7	276.7	2,206	2,717	3,123	406	14.94%
All other motor vehicle operators	282.0	277.0	275.0	282.0	277.0	275.0	282.0	277.0	275.0	-	27	28	1	3.70%
Rail transportation workers	**279.3**	**280.8**	**294.3**	**276.1**	**278.9**	**294.0**	**277.8**	**281.6**	**296.0**	**117**	**82**	**79**	**-3**	**-3.66%**
Locomotive engineers	284.0	292.0	304.0	284.0	292.0	304.0	284.0	292.0	304.0	17	21	23	2	9.52%
Railroad brake, signal, and switch operators	261.0	260.0	281.5	261.0	260.0	281.5	261.0	260.0	281.5	-	18	13	-5	-27.78%
Railroad conductors and yardmasters	NA	NA	NA	NA	NA	NA	NA	NA	NA	29	25	25	0	0.00%
Rail yard engineers, dinkey operators, and hostlers	297.0	292.0	297.0	297.0	292.0	297.0	297.0	292.0	297.0	11	5	4	-1	-20.00%
Subway and streetcar operators	NA	NA	NA	NA	NA	NA	NA	NA	NA	8	13	14	1	7.69%
Water transportation and related workers	**255.0**	**254.0**	**261.0**	**255.0**	**254.0**	**261.0**	**255.0**	**254.0**	**261.0**	-	**52**	**48**	**-4**	**-7.69%**
Able seamen, ordinary seamen, and marine oilers	255.0	254.0	261.0	255.0	254.0	261.0	255.0	254.0	261.0	-	22	20	-2	-9.09%
Captains and pilots, ship	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	14	13	-1	-7.14%
Mates, ship, boat, and barge	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	7	7	0	0.00%
Ship engineers	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	9	8	-1	-11.11%

Average Prose, Document, and Quantitative Scores by Occupation; Number of Positions in 1986, 1996, and 2006; and Change from 1986 to 1996 and from 1996 to 2006

Occupation	Average NALS Scores									Number of Positions			Change in Number of Positions 1996 to 2006	
	1986			1996			2006							
	Prose	Doc	Quant.	Prose	Doc	Quant.	Prose	Doc	Quant.	1986	1996	2006	Number	Percent
Operators, fabricators, and laborers (Continued)	**264.5**	**263.4**	**270.5**	**261.7**	**260.7**	**267.2**	**264.3**	**263.4**	**270.4**	**16,207**	**17,862**	**19,365**	**1,503**	**8.41%**
Material moving equipment operators	**273.3**	**271.0**	**279.1**	**273.3**	**271.0**	**278.8**	**273.1**	**270.9**	**278.8**	**1,173**	**1,099**	**1,211**	**112**	**10.19%**
Crane and tower operators	284.0	280.0	284.0	284.0	280.0	284.0	284.0	280.0	284.0	57	46	45	-1	-2.17%
Excavation and loading machine operators	290.0	286.0	279.0	290.0	286.0	279.0	290.0	286.0	279.0	69	98	107	9	9.18%
Grader, bulldozer, and scraper operators	285.0	280.0	281.0	285.0	280.0	281.0	285.0	280.0	281.0	~	107	111	4	3.74%
Hoist and winch operators	288.0	283.0	288.0	288.0	283.0	288.0	288.0	283.0	288.0	~	9	10	1	11.11%
Industrial truck and tractor operators	268.0	265.0	275.0	268.0	265.0	275.0	268.0	265.0	275.0	~	479	536	57	11.90%
Operating engineers	275.0	278.0	294.0	275.0	278.0	294.0	275.0	278.0	294.0	147	158	180	22	13.92%
All other material moving equipment operators	267.0	265.0	273.0	267.0	265.0	273.0	267.0	265.0	273.0	~	202	222	20	9.90%
All other transportation and material moving equipment operators	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**~**	**151**	**173**	**22**	**14.57%**
Helpers, laborers, and material movers, hand	**257.5**	**256.8**	**262.5**	**257.4**	**256.7**	**262.4**	**257.1**	**256.4**	**262.2**	**4,558**	**4,976**	**5,654**	**678**	**13.63%**
Freight, stock, and material movers, hand	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	808	849	41	5.07%
Hand packers and packagers	250.5	250.0	261.0	250.5	250.0	261.0	250.5	250.0	261.0	~	986	1,208	222	22.52%
Helpers, construction trades	268.0	268.5	268.0	268.0	268.5	268.0	268.0	268.5	268.0	510	548	596	48	8.76%
Machine feeders and offbearers	278.0	275.0	279.0	278.0	275.0	279.0	278.0	275.0	279.0	~	265	263	-2	-0.75%
Parking lot attendants	NA	NA	NA	NA	NA	NA	NA	NA	NA	~	68	86	18	26.47%
Refuse collectors	243.0	241.0	256.0	243.0	241.0	256.0	243.0	241.0	256.0	~	116	123	7	6.03%
Service station attendants	253.0	253.0	264.0	253.0	253.0	264.0	253.0	253.0	264.0	~	174	174	0	0.00%
Vehicle washers and equipment cleaners	265.0	263.0	270.0	265.0	263.0	270.0	265.0	263.0	270.0	~	274	343	69	25.18%
All other helpers, laborers, and material movers, hand	255.0	254.3	258.0	255.0	254.3	258.0	255.0	254.3	258.0	~	1,737	2,012	275	15.83%

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Appendix B:

Methodology for combining estimated NALS scores and BLS employment occupation data

Step One: Creating a crosswalk between the data contained in the PDQ study (Rock and Latham) to the data contained in the Department of Labor files.

The PDQ report lists observed (from the 1992 NALS data and corrected for sampling issues) prose, document, and quantitative literacy scores for 239 occupations, as well as predicted scores, based on job attributes, for an additional 522 occupations not directly measured. Dictionary of Occupational Titles (DOT) job classifications were used in this study, although it should be noted that the authors used a crosswalk from Census data job classifications to the DOT classifications. From this data the estimated prose, document, and quantitative literacy scores for all 761 DOT classifications was extracted.

The job classifications used by the Bureau of Labor Statistics (BLS) for their employment projections are not based on DOT titles but instead based on Occupational Employment Statistics (OES) codes and titles. Using a crosswalk developed by the Department of Labor and found at their Web site, it was possible to manually merge the DOT and PDQ files with the employment projection data. In some instances no appropriate match could be found, and in those cases the tables include an "NA" for not available where the PDQ score would be located. In other instances a single OES code included more than one DOT code. In those cases the PDQ score was averaged across all matches as no means of determining a more appropriate weighting was available. In some instances the best match of DOT and OES codes resulted in only a portion of the appropriate PDQ data being available. It should be noted that some OES codes included in the crosswalk are not included in the projection data, presumably having been placed in final catch-all categories.

Once the prose, document, and quantitative literacy score data was merged with the 1996 employment figures and the 2006 employment projections, the resulting file was merged with the 1986 employment figures. However, not all categories used in 1996/2006 were used in 1986, so 1986 employment figures are missing for a number of occupations, due in part to the catch-all categories being much more inclusive in 1986. The changing nature of the catch-all categories led to their not being included in the tables, as any comparison between 1986 and 1996/2006 would have been misleading. Rather than having questions arise as to why the data for those categories was not reported in 1986, it seemed to make more sense to ignore them. This decision should not have a material impact on the final numbers.

Step Two: Creating the tables. The current tables include:

- *Occupation:* The OES job classification used in the Department of Labor Projections

- *Average Projected NALS scores for 1986, 1996, and 2006:* For rows in bold, these scores are computed and can change each year. Changes in these scores indicate that the proportions of jobs making up the category changed over time. Rows not in bold have consistent score values.

The computed means were created using the weighted average scores of all the individual occupations in that category. Occupations without prose, document, or quantitative scores were omitted from the weighted average, although they are still listed in the tables for completeness. For 1986, if no employment-level data was available for a specific occupation, a proxy value was computed at 84 percent of the 1996 employment level. This represents the average difference from 1986 to 1996 across all occupations. This proxy value was used to eliminate as much as possible inaccurate changes in the computed scores due to comparing what otherwise would be nonequivalent job baskets.

- *Number of Positions:* Data taken directly from the Department of Labor. Data from 1986 and 1996 is measured while the 2006 data is projected.

- *Changes in Number of Positions:* The raw number is the increase/decrease from year A to year B. The "Percent" column indicates the percent increase/decrease from year A to year B. The "Percentage" column indicates what portion of the overall increase in a given year can be attributed to that job classification. It is this data that is used to create the Top 25 tables.

04202-16540 • RR10M7 • Printed in U.S.A.
I.N.204913